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STRAWBERRY CULTIVATION

by the same author



GRAPES UNDER CLOCHES

MELONS UNDER CLOCHES

THE GRAPE VINE IN ENGLAND

FROM THE WASTE LAND

SOIL AND CIVILIZATION



La Sans Rivale photographed in October. In full fruit from July to November.

Strawberry Cultivation

*A System of Procuring Fruit
throughout the Year*

by

EDWARD HYAMS



FABER & FABER LIMITED

24 Russell Square

London

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(Reproduced by kind permission of East Malling Research Station, Maidstone, Kent)

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(Reproduced by kind permission of East Malling Research Station and the Editors of *The Annals of Applied Biology*)

Aphides feeding on young strawberry leaf

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INTRODUCTION

The principal object of this introduction is to record my great obligation to Major Douglas Corner and other workers at the Coronet Plantations, Greengarth, Five Lanes, Paignton, Devonshire, for so generously placing at my disposal their records and information gathered during twenty years' experimenting with hundreds of strawberry varieties. This help was particularly valuable in the matter of the old-fashioned varieties, of which Major Corner has a remarkable collection, and of the *remontants* varieties. The Coronet Plantations people are almost the only ones with a long and wide experience of these varieties in the British Isles.

The second point which I wish to make is that I have written nothing in this book which is not based upon personal experience as a grower, excepting where the contrary is stated in the text.

Something should be said concerning my recommendations of varieties whether *remontant* or otherwise, which are not yet commonly stocked by British nurserymen. These varieties are either old ones which have fallen out of fashion; or they are foreign. It did not seem to me that I should exclude from my book excellent varieties merely because they are hard to obtain, especially since they often possess qualities wanting in our own. Nurserymen naturally tend to confine their stocks of a fruit-plant to a small number of varieties, and only demand by the grower can check this tendency. A few nurserymen are beginning to stock *remontant* varieties, and in this connection there is a point of very great importance. No foreign country seems to take disease and

INTRODUCTION

pest control nearly as seriously as we do, and stocks from abroad are liable to be infested with pests of which we, at home, have got the upper hand. For example, tarsonemid mite. It is very important that the grower should get his stocks of foreign varieties through a nursery which can and will establish their own beds of these varieties, keep them clean of pests and rogue them for virus. There are at present in Britain stocks of some *remon-tants* which are rotten with virus and covered with pests.

In the section which deals with virus disease I have been lucky enough to have the help of several of the scientific workers at East Malling Research Station who know more about this subject than anyone else in the world, I think. They severely criticized my original script, and it was rewritten as the result of a day's arguments at the laboratories. The resultant script is by no means what East Malling would themselves write about strawberry virus, and the reader is urged to get and read the Station's own publications on the subject. My general opinions on this subject are my own, not the official ones, and it was only in matters of fact that the East Malling people, who also very generously lent me their photographs for reproduction, corrected me.

E. H.

I

THE NINE MONTHS' SEASON

If man ever has to give an account of himself as chief tenant of the planet, he will be hard put to it not to show himself deserving of severe censure. He has destroyed forests, befouled rivers and seas, created deserts, hunted, tortured and even exterminated many of his fellow species, all with complacent self-satisfaction. It is therefore to be hoped that if and when judgement is passed, attention will be paid not to philosophers and scientists, priests, statesmen and soldiers and other such noisy and uneasy creatures, but to a certain quiet and laborious kind of men called gardeners. And if this order of men and women be bidden to speak up, it is to be hoped that they will overcome their customary and decent modesty and say: we left the fruits of the earth finer than we found them. And since most members of the human race have appreciated the patient industry and beautiful works of these excellent craftsmen, perhaps it will be counted to us all for virtue.

In the long and fascinating story of mankind there is no more moving chapter and none freer from vice than that in which we read how man, by bringing together related species from remote places, or by isolating them, has increased the size, improved the beauty, lengthened the season, and bettered the flavour of wild fruits. Part of that chapter would deal with the strawberry: it would have to tell how for two and a half centuries the gardeners of Europe worked with the small wood strawberries of their continent until they had made many garden varieties of superior size and flavour. How new species were brought from remote Chile, newly colonized Virginia, from California and Alaska,

THE NINE MONTHS' SEASON

crossed, selected, recrossed until man had produced strawberries as big as plums on plants as large as a hearthrug, glorious in shape and colour, luscious in flavour.

A price, at which some grumble, had to be paid, for the terms of man's lease of Earth, although generous, are strict.

'Take what you want,' said God. 'Take it; and pay for it.'

In the small matter of the strawberries, payment has been made: our great, heavy-bearing cultivated strawberries are not so hardy as some of their wild ancestors, they are subject to disease and degeneracy; some claim that part of the original flavour and perfume have been lost.

The final achievement of strawberry gardeners is one which may, in England, be looked at askance. Until quite recently all but the very rich with their hothouses have only eaten strawberries during about three weeks of high summer: this brief season has given to strawberries a pleasant air of festival. For the more fortunate, strawberries and cream were associated with such pleasures as herbaceous borders in full flower, fine lawns, shaded walks in tended shrubberies, regattas, boats on calm green water, the lush grass of river meadows, girls in light frocks and big hats, men elegant in white. For the cockney strawberries have meant some freshening of the London streets by colour, the great piles of scarlet or crimson fruit on the barrows, the promise of sweet-acid refreshment.

The strawberry, then, has acquired extra merit by reason of the brevity of its season; it has been one of the joys which have the special attributes of the rare, the ephemeral and the recurrent. But now it is proposed to change this excellent tradition and to offer you, for your labour in the garden, or your money in the shop, fresh strawberries (none of your nasty quick-freeze apologies), during eight or nine months of the year. That extended season, it is true, calls for adventitious aids at either end, but even if you are to eat fresh strawberries only from May to October, and perhaps even cream too when those in authority turn their attention from the profits of trading in tinned milk from Toronto by way of Timbuctoo or Tokyo, to Britain's four-

THE NINE MONTHS' SEASON

teen million acres of half-derelict grasslands . . . will you then be grateful, or reproachful?

The amateur gardener has a free choice; he can either stick to the old short season for strawberries, or, considering the rarity of pleasure in this hard world, he can extend it. This book aims to tell him how to grow the best strawberries well, and how to do it during eight or nine months of the year. He can pick and choose his chapters, however. For his convenience the book is arranged in an unusual way, that is into a series of strawberry 'seasons', each with appropriate varieties and techniques.

To the professional grower it is suggested that whereas the older 'perpetual' or autumn strawberries, such as *St Fiacre* and *St Antoine de Padoue*, were insufficiently reliable as croppers for commercial exploitation; and whereas, even given a reliable strain in this respect, it was not possible to grow and ripen strawberries late enough in the year to command a really interesting price, all this is now changed. In such new varieties as *La Sans Rivale*, *Triomphe*, *St Claude*, *Record*, we have plants which normally and with regularity carry far heavier crops than any variety of summer strawberry and which carry the fruit throughout the late summer and into the winter. And in continuous cloches we have the means to give these plants a micro-climate in which they will continue to ripen even into November when, as in October, the price of strawberries exceeds that which is obtained for cloched strawberries in May, and even in April. Late in October the price from Covent Garden dealers who, God knows, although doubtless good fathers of families, are not prodigal with their money, will be of the order of seventeen shillings a pound for selected fruit. And it should be emphasized that the late strawberries from the new perpetual varieties are fit to be compared with the best summer fruits, not only in size and appearance, but in flavour.

II

ORIGINS OF THE STRAWBERRY, ITS INTRODUCTION INTO CULTIVATION AND IMPROVEMENT

The botanical description of the various strawberry species is relegated to an Appendix and for the present we ask the reader to be content with the four drawings illustrating this chapter, and the following brief notes.

Fragaria vesca, L. (syn. *F. silvestris* Duch.; *F. vulgaris* Ehr.)

This species occurs wild all over northern Europe, and in several varieties or sub-species. The fruit is small or very small, red or white, fragrant and of good flavour. Sterility is not uncommon, and the shape and size of fruits so various even in nature, that exact description is difficult. It is important to note that large-fruited varieties occasionally appear, even among wild populations of this plant, but that largeness is relative, and does not compare in size with the cultivated strawberries.

The fruit of *F. vesca* was well-known to the ancients as a wild herb of medicinal value, but it is never mentioned, even by the indefatigable Pliny, as cultivated. It was left to the Europeans of the thirteenth, or more probably the fourteenth, century to bring the strawberry into cultivation, and the first illustration of the plant occurs as a figure in the Mainz *Herbarius* (1454).

Records of the early history of plants in cultivation are necessarily scarce, even in the case of such a late-comer to the garden as the strawberry. But there are sufficient records to enable us to date strawberry culture back to the first decades of the fourteenth



FRAGARIA VESCA - Linn.

Fragaria Vesca, from *Le Jardin Fruitier du Muséum*, 1857



FRAGARIA MONOPHYLLA. Duch.

Fragaria Monophylla, from *Le Jardin Fruitier du Muséum*, 1857

ORIGINS OF THE STRAWBERRY

century. In the accounts of a north French hospital for the year 1324: *Pour fraisiers à planter en la montaigne acatés* (i.e., achetés) à Pierrot Paillet et Aelés Paiele, XII d. In 1836 the gardener of the French king Charles V set twelve thousand strawberry plants in the royal gardens. In England, the domestication of strawberries seems to have been later, but the fruit was grown in noblemen's gardens in the sixteenth century, for example at Kenilworth; and it was sold on the streets of London.

In 1600 Olivier de Serre, in his *Théâtre d'Agriculture*, was still recommending the gardener to seek his plants in the woods, and by transplanting them to the borders, and by care, to increase the size of the fruit. It is therefore clear that if the strawberry was first cultivated about 1400, two centuries of gardening care had made no great improvement in this fruit, a fact which might be considered a serious blow to the theories of Lysenko.

However, deviations from the type of *F. vesca* were noted in gardens from time to time. A runnerless variant appeared (*F. eflagellis*) about 1690, possibly as a bud mutant or a seedling. There was also the peculiar, single-leaved *F. monophylla*.

The wild autumn-fruiting strawberries known, when in cultivation, as Alpines or *Quatre Saisons* are not given specific status; they are *F. vesca*, in strains selected for late or perpetual fruiting habit. Alpine strawberries were first brought into gardens for their late fruiting attribute in 1530, but they do not seem to have been cultivated on any considerable scale until much later. However, their place of origin in nature is exactly known: it was *Mont Cénis*. In 1825 le Bandé introduced a strain of *F. eflagellis* into horticulture, for the convenience of its runnerless habit: this became the variety *Gaillon*, ancestor of such modern runnerless Alpines as *Reine des Quatre Saisons* and *Baron Solemacher*.

F. vesca is of no importance in the history of the modern garden strawberry, but it did prepare the way for those improved varieties of quite different species, played an honourable role in the fruit garden for several centuries, and still does so in the shape of the Alpine strawberries which, having fallen out of fashion, are now again being received into favour.

ORIGINS OF THE STRAWBERRY

Fragaria elatior Ehr. (syn. *F. moschata* Duchesne; *F. magna* Thuill.)

The second European wild strawberry is *F. elatior*, known, when in cultivation, as the Hautbois strawberry. This is another example of a plant once popular, fallen out of fashion, and then coming back, in our own time, for its musky flavour. It will be recalled by lovers of Jane Austen that the Hautbois were unanimously elected as the best in Mr. Knightley's garden on the occasion of the famous strawberry-picking and eating party (*Emma*). There is no record of the date of its introduction into the garden. It is less common and widely diffused than *F. vesca*, although the author and his wife once found nearly an acre of the species, during a war-time leave, in a queer bottom in Hampshire, and gathered several pounds in half an hour. The plants grew in association with vervaine and the whole valley, on a day of great heat, was full of the fragrance of strawberries.

Cultivated varieties of the Hautbois in English gardens were named *Black*, *Globe* and *Prolific*; in France *Royale*, *Framboise* and *Abricot*.

Fragaria viridis Duch. (syn. *F. campestris* Steven; *F. collina* Ehr.)

This, the third wild European species, was anciently widely cultivated, for despite its small size and coarse texture, the flavour and scent of the fruit are both delicious. So far as I know, however, the cultivation of this species has been long abandoned, nor does it appear to have played any part in the breeding of improved Alpine varieties. It is possible, however, that it may yet do so, for the species is remarkable among strawberries for its lime-tolerance. If this character could be transferred to hybrid offspring in which the more desirable attributes of superior species were retained also, then we should have a strawberry for chalk soils, resistant to chlorosis. *F. viridis* may possibly have played a part in the breeding of those Alpines which bear white fruits, for its own fruit is greenish white. But it may also be that some strains of *F. vesca* bear red or white

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fruits indifferently, in their natural state, a character which is present in such cultivated varieties as *Reine des Vallées* and *Baron Solemacher*. There does seem to me some slight evidence, however, that this character in these cultivated Alpine varieties is due to an *F. viridis* ancestor: white-fruited plants are much rarer in any plantation than the red-fruited ones, but the seeds of the white-fruited plants come true. The genetical argument which explains why this seems to indicate an interspecific cross at some stage is long and complicated, but probably sound, and in that case we already owe something, even in the modern garden, to *F. viridis*.

Fragaria virginiana Duch.

While the European wild strawberries were being introduced into cultivation, without any marked improvement in size or flavour over their still wild siblings, Columbus was discovering America and his successors exploiting it. Nothing about that event is more remarkable than the rapidity with which useful and beautiful plants of the New World were introduced into the old and spread all over it. Maize had actually reached China from South America, by way of Europe or Africa, long before America was explored or China opened up to the first Portuguese traders. Within two centuries of the discovery, the potato was on the way to turning Old World food economies upside down.

The exact date of the introduction of *F. virginiana* to Europe is unknown, but its presence in that continent was recorded, about 1624, by Jean Robin, botanist to Louis XIII. At that time Tradescant was on the continent seeking new plants for English gardens, and may very likely have been responsible for bringing the new plant to England. Even in the wild state, it was an improvement on the native species in the matters of size and colour but not in the matter of flavour. The author and his wife gathered great quantities of *F. virginiana* on the lovely Blue Ridge Mountains, in Virginia, near to the old Appalachian trail. Wild strawberries are still gathered in the United States, as an article of commerce by the indigent and as a form of recreation by the more fortunate natives.

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No important improvement occurred in *F. virginiana* merely as a consequence of cultivation, although doubtless the fruit may have been rather larger among domestic than among wild populations. No strawberry nearly as large or handsome as those to which we are accustomed in our gardens was known as a result of cultivating *F. vesca*, *F. elatior* or *F. virginiana*, and in so far as crossing between some of these species (but there is a difficulty here) was possible, the hybrids would not have had large fruit, at least by our standards. The subject of crossing between strawberry species and varieties will be dealt with presently.

Fragaria chiloensis Duch.

F. chiloensis, in one strain, occurs wild in certain parts of Chile, in Valdivia, and in the islands of Juan Fernandez. In another form it is native to the west coast of North America, and to Alaska.

In the wild state, and in cultivation in the gardens of the Chilenos, it is a comparatively large-fruited species, and it was the large fruit which, late in the eighteenth century, drew the attention of a French Naval Officer called, oddly enough, Frézier (*fraisier*, strawberry plant), a Gallicized version of Frazer. This officer brought plants of *F. chiloensis* to France, but only five survived the journey and these, unfortunately, were all pistillate plants, the species being dioecious. A single plant is supposed to have been planted among other strawberry plants near Brest, to have been fertilized by their pollen and to have borne fruit. It was said to have been propagated by runners.

Other plants of *F. chiloensis* were sterile until the botanist Duchesne fertilized the flowers with pollen of *F. virginiana*.¹ Although it is probable that *F. chiloensis* and the European species are not normally or easily interfertile, no such difficulty

¹ My own reading of the story. Authorities say Hautbois. But the seeds resulting were said to be fertile and to have given rise to seedlings, a probable impossibility, and at all events a great improbability if the pollen came from the diploid *Hautbois*, since *Chiloensis* is an octoploid. On the other hand since Duchesne's seedlings were pine-flavoured, i.e. musky, it seems probable that *Hautbois* was in fact, the parent. Do polyploid *F. moschata* occur in nature?

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occurs in the case of *F. virginiana*. At all events, Duchesne obtained hybrid plants, whatever the parents, and from these came, in due course, the first large-fruited, cultivated strawberry, the variety *Ananas*, the *Pine* strawberry. Even this, however, does not compare in bulk with our modern fruit.

Fragaria californica Chamisso and Schlechter (syn. *F. servicia* Douglas, *F. lucida* E. de Vilmorin)

F. californica occurs in great fields on the Pacific coast of America from California to Alaska. It is a sturdy, pretty little plant, and the fruit, although it is small, is of such good quality and the plants so hardy that the pomologist A. F. Etter made much use of it in crossing with large-fruited garden varieties, chiefly in Australia, as did C. C. Georges in Alaska, both these workers obtaining excellent garden varieties hardy in their respective countries. The species does not appear, however, to have contributed much to our own cultivated varieties and is less important horticulturally than the other American species excepting in those countries where its special attributes are called for.

Fragaria cuneifolia Mittal; *Fragaria platypetalla* Rydberg

Etter also made use of *F. cuneifolia*, a species or sub-species¹ native from British Columbia to Oregon and Idaho, not described until 1908 and of dubious specific status, seeming rather to be a strain of *F. virginiana*. Another strawberry, in similar case, *F. platypetalla*, native from Alaska to Montana, was also employed in breeding garden varieties for the Alaskan climate.

This completes the list of wild strawberries which have contributed to our gardens.

The work of Duchesne, both in systematic description of strawberry species, and in the breeding of garden varieties from species now at last brought together from all over the Western world, was rendered abortive, in France, by the Revolution, but in England his results were taken up by growers and botanists and, as a result of the work of two very different men, straw-

¹ F. Lesourd: *Le Fraisier*.

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berries comparable with the very best we have were produced. Michael Keens, working with *F. virginiana* and *F. chiloensis*, produced such garden varieties as *Duke of Kent* and *Carolina*, improved on these with *Keen's Imperial* and triumphed with *Keen's Seedling*, a variety sensationaly outstanding, in its day, for size and flavour. It came into commerce in 1821, was the parent of our modern strawberries, and spread to the continent and to America. Of Keen's work on strawberries, E. A. Bunyard wrote that it was unsystematic, empirical, and that *Keen's Seedling* was a stroke of luck. No doubt it was so, but scientific men are prone to overlook the curious and inexplicable 'tact' with plants which enables the unacademic, practical plant-breeders to get results.

T. A. Knight was a more scientific worker who made thousands of cross-fertilizations among his plantations of *F. vesca*, *F. elatior*, *F. virginiana*, *F. chiloensis* and hybrids and varieties including, no doubt, Keen's. Knight's best large-fruited hybrids were *Downton* and *Elton Seedling*, both of uncertain origin, but probably beginning with a *virginiana* x *chiloensis* cross.

The strawberry as we know it was thus the work of Englishmen using French material, as it were. The new large-fruited strawberries were hailed with admiration on the continent, where they were used to produce a whole range of new and improved varieties, as they were in Britain, but the next major improvement occurred in 1878 when Thomas Laxton began to work on strawberries, producing several superior varieties and finally, in 1892, crowning his work with a variety which has still, according to some growers, not been improved upon for size and exquisite flavour, although its strength and vigour have departed: *Royal Sovereign*.

Meanwhile, on the Continent, another line of development was being drawn, that which led to the large-fruited autumn or perpetual strawberries (*frasiers à gros fruits remontants*) which, for no reason that I have been able to discover, have never yet been much grown in England, although they succeed here to admiration, but which seem likely to find their place in the English garden at last, largely as a result of the work of a gifted

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amateur, Major Douglas Corner, and of the work of Mr. G. M. Taylor in Scotland, and the pungent propaganda of Mr. P. Morton Shand.

The small-fruited Alpine strawberries, which were the first to be cultivated before *F. chiloensis* gave plant-breeders a larger variety to work with, have a perpetual or autumn habit of bearing. From their beginnings in cultivation more or less successful attempts were made to increase the size of their fruits, both by care in cultivation and by selection in propagation. The nature of the plant, however, set a limit to this process, and the maximum sizes obtained could only be transcended by cross-breeding: but there were no large-fruited species with which to cross the European varieties, and the limit of size was therefore reached in such Alpines as *Reine des Quatre Saisons* (Gautier, 1850); *Comtesse Pierre de Brye* and *Monstrueuse Caennaise*. The admirable Alpine variety *Baron Solemacher* has been induced to bear fruits of a surprising size, by the author, by rich feeding and the removal of half the fruit as it forms.

When, in the nineteenth century, large-fruited, short-seasoned varieties were at last obtained by English workers, interest in the long-season Alpines failed, but not so in France. True, the 'fraises anglaises' such as *Elton* and *Keen's Seedling* were welcomed and improved. But French growers were encouraged in their efforts to obtain large-fruited perpetual or autumn varieties, based on their Alpines. Ultimately they were successful, but the origin of their success is obscure: varieties were obtained which, like the Alpines, produced a succession of 'flushes' of blossom, late into the autumn, and fruit comparable in size with the 'fraises anglaises'. But there is a genetical mystery connected with this success.

The story is as follows: the parish priest of Chenoves (Seine-et-Loire) had long been experimenting with both Alpine strawberries and the 'fraises anglaises'. He produced a variety with a prolonged flowering and fruiting season, extending into the autumn, and large fruit. He claimed to have done this by crossing an Alpine strawberry variety with a 'fraises anglaises' variety. Although no one else had, in fact, succeeded in doing this, there

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was at that time no scientific reason to doubt the claim of this enterprising ecclesiastic. It is only now, when we understand more of genetics, that we are forced to regard the Abbé Thivolet's claim with suspicion. All the Alpine varieties, being improved *F. vesca*, are diploid plants. The 'fraises anglaises', that is the large-fruited, short-seasoned June strawberries, are all octoploids. Geneticists say that cross-fertilization between these is not possible, or rather that the resultant seed is sterile. There is no need to go into the reason for this: it derives from the fact that such a cross produces an uneven number of chromosomes in the gene, and that you cannot exactly halve an uneven number in units. It is not necessary to call the reverend gardener's good faith in question. He no doubt went through the motions of fertilizing a flower of some Alpine variety with the pollen of some large-fruited variety. One of the seedlings became the prototype of the perpetuals: probably a fortuitous cross-fertilization between the pistillate parent and some interloping octoploid variety in the garden was the real origin of the new variety: the two parents might have both had a tendency towards a prolonged fruiting season: some of the ordinary varieties do so, as some have a tendency to crop a second time in the autumn. In certain conditions some attribute in a seedling can transcend the same attribute in both parents.¹

Other possible explanations are: chromosome mutation or that the Abbé was telling the simple truth; it has lately been possible to produce, by the use of colchicine, octoploid *F. vesca*. If this can be done with colchicine, it can also happen 'by accident'; mutations producing polyploidy are not so very uncommon in nature. In such a case the Abbé Thivolet's cross would have been possible. Or, it is suggested, the first perpetual variety was really produced by a long process of selecting, generation after generation, for long-season individuals. But that would make the Abbé out a liar, which would be a pity.

At all events, Thivolet's variety *St. Joseph* was the first perpetual large-fruited strawberry: it is cultivated in the author's

¹ Where both parents are heterozygous for the attribute or character, and the later is polymerous.

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garden and is still worth growing. The Abbé crossed St. Joseph with many large-fruited varieties, and finally with our own *Royal Sovereign*: the issue of that happy combination, the perpetual *St. Antoine-de-Padoue*, is still admirable and in my own garden is superior in vigour and disease-resistance to its English forebear, the fruit as large, produced spring and autumn, and of a flavour not much if at all inferior to the old *Royal Sovereign*.

With *St. Antoine* as one parent, the Abbé Touraine and Louis Gauthier bred still better perpetuals, notably *Suavis* and *Merveille de France*. These, with Vilmorin's pine-apple flavoured *St. Fiacre*, once quite widely grown in England, were twentieth-century achievements.

In 1925 Monsieur Charles Simmen of Montmorency produced his *France Pacifique*, and that vast plant with huge fruit in copious quantity, *Record*. A well-grown plant of *Record* may occupy a square yard, and an acre of it bear twenty tons of fruit of good quality in one season. Only the self-sacrificing conservatism (which prefers annual losses and the right to grumble, to annual profits and a new car) can have stopped this or some similar varieties, of which there are several, from displacing the commercial varieties in Britain. It is the cultivation of enormously prolific perpetual varieties which enables continental growers to undersell the English grower of jam fruit, persisting in the cultivation of the miserable *Huxley*.

Monsieur Simmen's Charles (Géant) Simmen is the most handsome strawberry plant and the bearer of the largest fruit in the author's plantation. The fruit are coarse in appearance, lumpish, brilliant vermillion with a polished surface, very sweet and high flavoured.

Other breeders of perpetuals were at work. The great Louis Gauthier was succeeded at Caen by Monsieur Roland Chapron who produced first the variety *Madame Raymond Poincaré* and then *La Sans Rivale*, and *Triomphe*. In Kent, *La Sans Rivale*, when fully grown, consists of a solid mass of stiff, healthy foliage about a foot to fifteen inches tall and covering about four square feet or a shade less. It produces on stout stalks trusses of large, regular, crimson fruit with the same shapes as *Royal Sovereign*.

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but a better colour. The flavour is good. The fruit are very firm, apparently almost immune to botrytis. Each plant produces about four pounds in a season. *Triomphe* is superior in flavour, ripens better in October and early November, but it is pale orange, button shaped, rather soft, and liable to botrytis.

There are very numerous other varieties with which we shall deal when we come to the question of the autumn strawberry crop. Here we are dealing with the history of the subject, which ends when we arrive in our own times. News is not yet history.

Austrian growers became interested in perpetuals about 1920 and have produced commercially valuable varieties, notably *Kuntner's Triumph* which, for reasons which will appear in their place, may turn out to be the most valuable and interesting of all the perpetuals, for it can be kept in the plantation, with a special technique of runner-planting, for eight or ten years without replanting. In Germany the West German Research Station at Osnabroeck has taken up the perpetuals. Only in Great Britain are we too busy propping up virus-debilitated varieties, or breeding short-season ones to take their place, that we have had no time for the long-season plants. On the other hand, in the United States the perpetuals have a history of their own. According to the U.S.A. Farmers' Bulletin No. 901 :

'On 28th September 1898, Samuel Cooper of western New York, while examining his field of strawberries, noted a plant with several runners attached all of which were bearing blossoms and fruit in all stages of development. The plants among which these were found were of the *Bismark* variety, which is reported to be a cross between the *Van Deman* and the *Dubach*. Mr. Cooper set aside these plants which were bearing fruit in the fall and named the variety *Pan-American*.'

Now this is of particular interest because here there is no history of selection of later and later-fruiting strains; on the contrary, the variety, with the autumn bearing habit complete, suddenly appears in an ordinary plantation of a variety which had not formerly shown any such habit. The account does not tell us whether the *Bismark* plants were first generation seedlings of the two parents named: more probably they were vegetatively

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propagated plants of an already established variety. In the former case the appearance of the variety subsequently named *Pan-American* would be due to a chromosome mutation; in the latter case to a bud sport, which seems the more probable in that only a single plant was involved.

Pan-American beds were worked over by selection to produce new strains, culminating in the variety *Superb*. By crossing with Louis Gauthier's varieties, *Pan-American* also gave rise to *Progressive* (by Rockhill of Iowa), until recently the standard American perpetual. Either through want of skill or want of luck, the American perpetuals had more faults than the French, did not combine all the attributes of a good strawberry plus the long-bearing season. Voer of Indiana bred *Mastodon* out of *Superb* and an unknown second parent, and this variety remains of great commercial importance. Very recently, however, new perpetuals have been appearing on the American market, notably the enormous and very vigorous *Red Rich* which resembles *Charles (Géant) Simmen* but produces very numerous runners, which the French variety does not.

List of Modern Perpetual or Autumn Fruiting Varieties of Commercial interest, to be referred to later in this work

FRENCH

La Sans Rivale	R. Chapron
Triomphe	R. Chapron
St. Claude	Rivoire
St. Fiacre	Vilmorin
Record	Simmen
Libération d'Orléans	Joly
Général de Gaulle	Maillochon
Inépuisable	Chapron
Charles (Géant) Simmen	Simmen

AUSTRIAN

Kuntner's (Pineapple) Triumph	Kuntner
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GERMAN

Herbstfreude		Schindler
Ada Hertzberg		Hertzberg
Heinemann's Unerschopfliche		Hertzberg
Holstein (or Hamburgh)		Sturm

AMERICAN

Mastodon	Voer	Superfaction	?
Gem	?	Red Rich	?

III

SOIL FOR STRAWBERRIES: MANURING

It is, of course, a waste of time—often indulged in by horticultural experts—to tell gardeners that they must plant strawberries in such-and-such a soil. Most of us have only one garden, and that endowed with the soil of the neighbourhood. Still, as most soils can be, and commonly are, modified by cultivation, there is some point in trying to decide what sort of soil is most rewarding to strawberry plants so that an attempt can be made by the small grower to bring his soil nearer in texture and content to what is required by strawberry plants.

There are several ways of arriving at a useful result. As the King of Hearts said to Alice, or, for that matter, as Aristotle said to his readers, begin at the beginning. The beginning, in this case, is to find out what kind of soil is favoured by wild strawberries; more exact information can then be obtained by experiment, and useful data will be found if we observe the kinds of soils in which strawberries are best cultivated on a large scale.

Wild strawberries are woodland, parkland and mountain plants. This means that they grow most readily in soils which are rich in humus and have an acid reaction. In chalk soils strawberries, excepting for *F. viridis*, of which we have as yet no cultivated varieties, suffer from chlorosis, some varieties more gravely than others. In sandy soils, in gravels, and in clays poor in humus, strawberries grow weakly, stand badly, are prone to suffer from drought and seem to be more susceptible to the disease which is associated with the presence of certain plant viruses.

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From this it is clear that the strawberry beds should be enriched with large quantities of organic material, peat, compost, farmyard manure, leaf-mould, shoddy and so forth. All these and other organic materials will be the better for thorough composting before they are used, and probably the best conditions for strawberries, as for many other crops, are created by heavy dressings with the Howard or 'Indore' compost, which is made by rotting down as many kinds of organic matter as possible with about a third of their volume of animal dung. For what it is worth, my own method is as follows: the strawberry beds are deep-dug and Howard compost, at the rate of 50 tons to the acre—which is about 25 lb. to the square yard—is incorporated with the top spit. Subsequent manuring consists of mulching with sifted compost mixed with small quantities of blood and bone. The top of the soil is kept covered with compost, because we have noticed, with strawberries, as with grapes and roses, that this appears to control fungus diseases, although I do not understand how or why. With this method we get larger plants, which remain healthy for longer and bear larger crops of bigger fruit than we normally see in gardens or commercial plantations.

So much for what we can learn by the empirical method. Now for science.

First of all, the serious strawberry grower who can read French should hasten to buy a copy of Professor Vercier's *Le Fraisier*, published by Messrs. Hachette, in Paris (1942). This manual probably contains more valuable information on the feeding habits and needs of strawberry plants than any other book ever published.

To find out what mineral elements a plant, or its fruit, takes from the soil in which it is planted, the substance of the plant, or the fruit, is analysed chemically. The analysis is very far from revealing all that we need to know, but it does reveal the principal elements consumed by the plant; and if we know, from a significant number of analyses of typical plants, that an average strawberry plant of a given variety, at maturity, carrying fruit, contains so many grammes of nitrates, phosphates and potassium salts, calcium, magnesium and iron, then, even though we

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may not know the trace elements, we can estimate what a field of strawberries withdraws from the soil in a season and, therefore, what we should replace in that soil in order to maintain the fertility of the field, and so the performance of future strawberries planted there.

In the course of very numerous analyses over a number of years it has become clear that the absorption of the three principal nutrient minerals by strawberry plants varies surprisingly from variety to variety. However, a rough and preliminary division into three groups can be made. The grossest feeders are the large-fruited perpetuals, and this is what we should expect since they crop far more heavily than any other groups of varieties. Second come the Alpines, which also draw very heavily on the soil; in fact, some varieties are more exigent than some varieties of perpetuals. The least greedy or demanding of the three groups are the ordinary short-season, June-July strawberries which we usually grow.

Taking as a basis the figures for that last-named group, the ordinary strawberries, the average absorption of nutrient minerals per acre per season is:

Nitrates	59 lb.
Phosphoric acid	53 lb.
Potash	57 lb.

These figures correspond to an annual dressing per acre of:

a $1\frac{1}{2}$ per cent nitrate fertilizer	$8\frac{1}{2}$ cwt.
an 18 per cent phosphate fertilizer	$6\frac{1}{2}$ cwt.
Potassium sulphate (50 per cent)	1 cwt.

Please note, however, that this method—of simply replacing the minerals consumed by dressing with chemical fertilizers—is not, repeat not, recommended in practice. The figures are for the purpose of comparison with those for other crops and to give an idea of what weight of real manures will be called for in order to maintain a soil rich in nutrients. But, above all, the figures tell us something else: that if the grower about to plant

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strawberries avails himself of the soil analysis, which will be done free by the office of his County Horticultural Adviser, or by the N.A.A.S., then he should not plant unless the readings for phosphates and potash are 'High', or until he has built these nutrients up to 'High', should they appear, upon analysis, as 'Low' or 'Medium'. This building up can be achieved by the liberal use of compost or farmyard manure, which will, at the same time, improve the texture and the structure of the soil: but the reading, upon further analysis, will not immediately be higher where such organic manures have been used, and if the grower is in a hurry he can raise the phosphate content of the soil by the use of steamed bone flour, and the potash content by the very liberal use of fresh wood ashes or of potassium sulphate, which does not seem to be a particularly deleterious substance.

Using the figures quoted above for comparison with other crops, an average acre of strawberry plants absorbs twice as much nitrate, nearly four times as much phosphate, and three times as much potash as an acre of wheat. It is now clear why our grandparents dressed strawberry beds with animal manure at the rate of 50 tons per acre per annum. But it should also be noted that the average crop of strawberries from the plantations which were the subject of these analyses, in France, was 15,000 kilogrammes per hectare, which works out at about six tons of fruit to the acre, comparing favourably with the yields in this country of even fifty years ago, when they were a great deal larger than they are to-day. It is commonly, and perhaps correctly, claimed by scientific agronomists that chemical fertilizers have increased wheat yields. How singular, then, that in the case of a plant which consumes more than twice as much of all mineral nutrients, the yield should have fallen by more than 30 per cent since the introduction of chemical fertilizers!

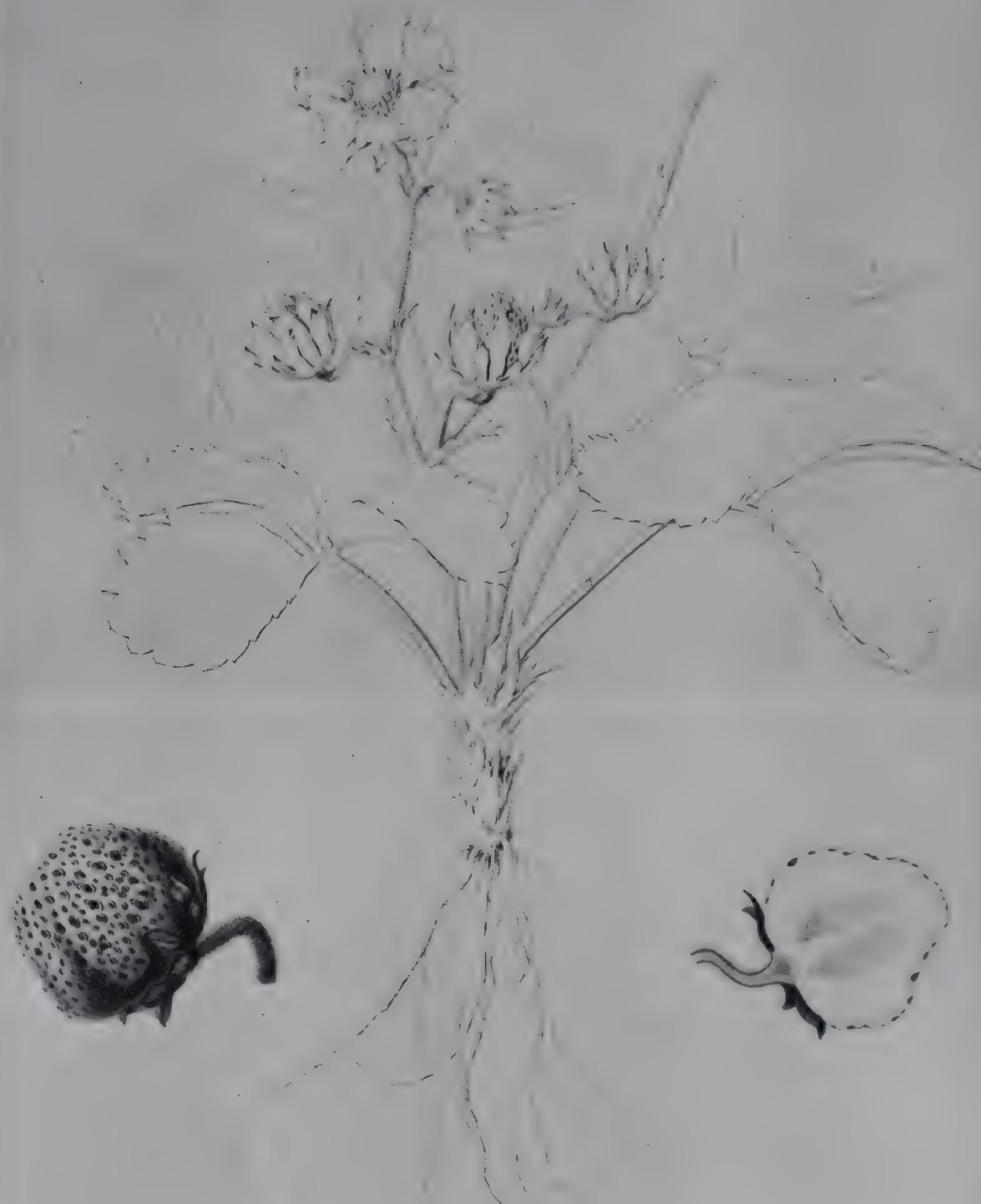
The fact is that no amount of industrial fertilizers will help the grower unless the soil is alive and rich in humus. To that end large and regular supplies of compost and/or farmyard manure are necessary. Here, in my own translation, are the words of a man who has studied strawberry cultivation intensively, in



FRAGARIA VIRGINIANA - Linn.

Fragaria Virginiana, from *Le Jardin Fruitier du Muséum*, 1857

JARDIN FRUITIER DU MUSÉUM.



FR. DU CHILI.

Fragaria Chiloensis, from *Le Jardin Fruitier du Muséum*, 1857

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several countries, for forty years, and who is so far from being a 'compost mystic' that he advocates the use of chemical fertilizers in the proper conditions :

' . . . strawberry plants are frequently struck down by virus disease (*dégénérescence*). Where is it that we have especially noticed the virulence of this disease? . . . In soils poor in humus: in the small gardens of amateurs (this is in France—E.H.) which receive, on the whole, no farmyard manure; in light and gravelly soils where nitrification is necessarily rapid and which sometimes go for several years without organic manure. Such soils receive chemical fertilizers, easier to carry, to spread, and above all to dig in: in most cases a largely sufficient annual dressing of these is administered. One cannot accuse such soils of being wanting in the principal nutrient elements since these are generously provided.

'What is lacking is humus, that unctuous humus obtained by good dressings of farmyard manure, humus in which numerous rootlets multiply and ramify and feed, finding just that humidity which, by persisting even in summer, saves the plants from flagging. Humus, in the form of farmyard manure . . . or of compost, will revive a failing plantation and, moreover, will attenuate the evil with which we are here concerned to such an extent that its symptoms become invisible to all but experienced eyes. Humus, by means of its physico-chemical attributes, seems to contribute towards the regular nourishment of the fruits, so that they become of sufficient size and satisfactory regularity.

'A fruit dealer from the Lyons region who had doubtless observed these facts for himself over a course of years, informed us that he would pay in future a supplementary bonus to fruit-growers whose fruit came from plantations manured uniquely with farmyard manure; and that such fruits were better coloured and definitely more able to stand up to travelling.'¹

From the second and third methods of investigation into the nature of soil required by strawberry plants we have discovered the figures for the consumption of mineral nutrients by straw-

¹ *Le Fraisier*. M. et J. Vercier. Hachette.

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berry plants ; that these are higher in the case of perpetuals and Alpines than for ordinary strawberries ; that they are much higher than for, e.g. wheat ; that while the withdrawal from the soil of these nutrients can be made good with chemical fertilizers, it seems probable that such a practice, for reasons which are not yet clear, is conducive to the increase of virus diseases ; that the use of organic manures, on the other hand, not only helps to keep virus disease down, but contributes to the commercial qualities, as well as the gastronomic qualities, of the fruit grown.

From these conclusions, combined with those obtained by the first method, it is perfectly obvious that only organic manures should be used in the preparation and dressing of strawberry beds. Such treatment will supply the plant foods needed, and it will also tend to make the soil of the strawberry plantation, or beds, more nearly resemble the natural soil of the wild strawberry. For example, constant heavy dressings with properly made 'Indore' compost will not turn a soil seriously acid, but it will tend to keep the pH below 7—that is on the acid side of neutrality. But it is not only the chemical reaction of the strawberry bed, and its analysis, which should be considered : its texture and structure, upon which depend aeration, absorption and retention of moisture, ease of working, and other desirable attributes, is quite as important.

If the grower relies upon replacing the minerals consumed with industrial fertilizers, and does no organic manuring, when the humus which is present in the soil has all been destroyed by the nitrifying bacteria and eaten up by the plants, the structure of the soil will collapse. From a crumbly, loose, friable, spongy, water-holding mass, the soil will degenerate into a bed of dust, or a solid pan, according to its physical nature and to the weather. The reason is that one of the by-products of decay of animal and vegetable wastes is a certain resin, or resins,¹ which have the power to cause very small particles of clay or sand to adhere together in relatively large crumbs, upon which good soil structure depends ; and in the absence of such resins the soil,

¹ The polysaccharides and polyuranides.

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as it were, falls apart into a dead dust or cakes into a solid, cement-like pan, both precursors of soil erosion.

The conclusion is that the soil of the strawberry beds must be rich, deep brown or black, that its organic content must be constantly renewed, that it should be on the acid side of pH 7, of loose, large-crumbbed structure. It does not matter whether you start with clay, sand, or gravel; such a soil can be *made*, by a sufficient use of compost, of farmyard manure, hop manure, bone-meal, blood, night soil, *well-composted* seaweed,¹ oil-seed husk meals, hoof, horn; in fact, anything organic whatsoever, properly composted. The labour of making such manure can be paid for by saving on the fertilizer bill—at about £35 a ton—by the longer life of the plantation, by a reduction in the cost of rogueing and replacing virus-debilitated plants, and by larger crops of better fruit which, being graded higher in the market, will fetch top price.

Despite all of which—and we affirm it to be true, to have been established by experience, and to be sound in any case—we propose to print here a programme of fertilizer dressings. The reason for this inconsistency is simple. The prejudiced reader can easily dismiss all the above as a product of the ‘muck and mysticism’ school, and not based, as in fact it is, on sense and experience. The following recipes for dressing strawberry beds have been tried in Britain and France and the United States—and they work. In my opinion, they involve the grower in too much expense, and give him a smaller crop of fruit of a quality inferior to what he could get from the same plants. However, he can console himself with the happy thought that he is helping to pay the dividends of shareholders in industrial chemical undertakings—probably a most deserving class of people. Moreover, where chemical fertilizers are used as well as, and supplementary to, real manures, very little harm, and some good, may result. The practice not only helps to keep the directors of I.C.I. and I.G.F. and Dupont de Nemours *et alia* in that comfort and security which is due to the astute, it may also be justi-

¹ ‘Raw’ seaweed should never be used: it conveys a vile taste to most crops.

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fied on horticultural grounds. Many phosphate fertilizers are as 'natural' as composts, e.g. crushed phosphatic rocks or ground bones. I believe that a long and properly planned course of organic manuring will maintain soil nutrients at a high level; but during the first four years of such a course there may be difficulties, even symptoms of deficiency. This is because soil takes a long time to assimilate organic material. Moreover, the small commercial grower of fruit, the amateur, the specialist in fruit, cannot practise the whole husbandry of organic farming, entailing as it does the balance, on the farm, of animal, arable, and pasture with deep-rooted 'weeds'. Specialization in farming is pernicious, but it exists, and nothing we say will abolish it.

1. Sandy, gravelly, permeable soils, tending to drought and of low fertility.

Before planting: apply a dressing of 20 tons of rotten cow-dung or good compost to the acre.¹

Thereafter annually per acre:

Winter 8 tons of compost or manure
3 cwt. superphosphate
1½ cwt. potass. sulphate

March 2 cwt. nitrate of soda.

2. Deep, fertile, richly organic soil, e.g. a mature garden.

Before planting: 15 tons rotten cow-dung or compost.

Annually per acre:

Winter 9 cwt. bone-meal
1½ cwt. potass. sulphate

March 9 cwt. dried blood
1½ cwt. sulphate of ammonia.

3. Siliceous soil, free from lime.

Before planting: 20 tons rotten cow-dung or compost.

¹ Conversion factor for the small grower $\frac{\text{Quantity per acre}}{480} = \text{Quantity per ten square yards.}$

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Annually:

Winter 6 tons rotten dung or compost
1½ cwt. potass. sulphate
7 cwt. bone-meal
3 cwt. chalk

March 1½ cwt. sulphate of ammonia.

4. Heavy or medium clay on chalk subsoil.

Before planting: 20 tons rotten dung or compost.

Annually:

Winter 8 tons loam or granulated peat
1½ cwt. potassium chloride
2½ cwt. bone-meal

March 1 cwt. nitrate of soda.

MANURING FOR SPECIAL PURPOSES

The response of strawberry plants to certain manures or fertilizers is known. Where it is required to increase the weight and size of fruit, and to bring forward the date of ripening in an established bed, 6 to 10 tons of rotten cow-dung per acre, supplemented by fertilizers in the proportion: nitrate 5, phosphate 4, potash 2, will do the trick. Where it is required to improve the flavour and perfume of the fruit, regardless of the weight of crop, then reduce the dressing of dung to a maximum of 6 tons, and use 1 cwt. of nitro-chalk in March and another in May.

Here, in addition, is a refinement: the Station Agronomique, at Dijon, found that if a very small quantity—only 1 oz. per 40 square yards—of colloidal magnesium silicate was given with the other dressings, a most astonishing increase in the weight of crop resulted: the figure was 28 per cent. Very likely it is safe to rely upon the presence of this trace element in a good compost, which may account for the superior results following its use.

It should be clear from the above that whereas strawberries can be successfully cultivated commercially only where the soil

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is suitable—that is, where it is a deep loam of forest origin and low pH—the amateur gardener, whatever his soil, can grow strawberries if he will take the trouble to create a suitable soil for the strawberry beds, which he can do unless he has a chalky topsoil, in which case there is probably little to be done. Even in those unfavourable conditions, strawberries *can* be grown, if extra heavy organic manuring is resorted to and if the strawberries are treated as annuals; for, as a rule, chlorosis does not appear very gravely until the second year.

Urban gardeners need not be discouraged by the figures given for organic manure: the quantities, when it is a question of the small garden strawberry bed, are not large, there are numerous prepared organic manures and composts on the market, and as for making Indore compost in the absence of animal dung, sewage sludge is cheap and plentiful everywhere, and not nearly so nasty to handle as its name implies.

A final note upon this subject of strawberry soils and their manuring: not all strawberry varieties require exactly the same kind of soil. I grow about thirty varieties, all in brick-earth clay which is stiffish and very far from the ideal here described. Some varieties do quite well in rough, field conditions, on 'unmade' soils, e.g. Charles Simmen's perpetual, *Record*. Other varieties do call for the best soil conditions, and in my opinion *Royal Sovereign* is a case in point. The complete gardener will experiment with varieties until he finds one to suit his soil.

In the case of the strawberry, as in the case of other fruits, great quantity of crop is not compatible with the very finest quality. A satisfactory compromise can be reached, but the gardener who does not care for quantity but does want the finest flavour and perfume, will plant in a rather poor soil, will be more sparing with manures than we have suggested, generous only with phosphates. On the other hand, the commercial grower who wants 6 tons of fruit to the acre will best achieve this on soils into which enormous quantities of organic manures are poured annually. Our ancestors of less than a hundred years ago got 5 and 6 tons an acre from their strawberry plants; the French, to-day, get the same, or better, from ordinary summer

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varieties, and up to 20 tons from their *remontants*—the perennials, with which we deal in a later chapter. In Britain to-day, 3 or 4 tons per acre of chemically fertilized land is reckoned quite good. It is no wonder that growers cannot make strawberry growing pay at less than 2s. 6d. the lb. retail: they are not getting enough out of their land; but perhaps this is because they are not putting enough into it, as well as because they are growing the wrong varieties.

IV

VARIETIES IN GENERAL: STRAWBERRIES FOR THE EPICURE

The plan of this book does not include a chapter in which the whole list of varieties is given and discussed, because the subject of strawberry growing has been divided into a series of seasons, to each of which certain varieties are appropriate, and in which they appear and are described. But some explanation of the concept 'variety' is called for, and this short chapter will be devoted to it.

The whole great list of strawberry varieties is clearly divisible into three groups, as follows:

GROUP ONE

The ordinary, or summer, strawberries which bear their large fruit between the beginning of June and the middle of July. In France they were known, and by some still are known, as '*fraises anglaises*', since it was in England that they were first produced. They are, in short, the common or garden strawberries of commerce.

Examples of Group One

Royal Sovereign
Auchincruive Climax
Cambridge 173
Surprise des Halles
Deutsche Evern, etc., etc.

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GROUP TWO

The Alpine or *Quatre Saisons* strawberries. These are the small-fruited varieties of *F. vesca*, and possibly of *F. moschata*¹ and other wild European strawberries, bearing fruit continuously, or in flushes, from June until November.

Examples of Group Two

Baron Solemacher
Reine des Vallées
La Brillante, etc., etc.

Strictly speaking, Alpine strawberries are not *fraises des bois*, but they are grown and served as such, and for ordinary purposes can be considered as cultivated *fraises des bois*.

GROUP THREE

These are the Perpetual or Autumn strawberries, known in France as *fraisiers à gros fruits remontants* and in the United States as *Ever-bearers*. I prefer the term *perpetual large-fruited*, shortened to *perpetuals*, and it must be remembered that these are very distinct from the Alpine strawberries. Many nurserymen, with no stocks of perpetuals, but who wish to advertise themselves as selling autumn strawberries, have caused disappointment and misconception among their customers by selling Alpine varieties as autumn strawberries. The fruit of perpetuals is as large as, and often much larger than, that of ordinary summer strawberries. The perpetuals bear fruit continuously, or in flushes of greater or less density, from May to November. Typically, there is a crop coincident with that of the ordinary strawberries, then a pause, and a further crop beginning late in July, reaching a peak in August/September, and falling slowly off throughout October and into November. In

¹ *F. moschata* cultivated varieties are the *Hautbois* strawberries now very hard to find. They are not, strictly, Alpines, of course, but they are small-fruited strawberries.

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some varieties there is little continuity, but several cropping periods separated by pauses. In the case of the older varieties this is so. Again, some varieties have two short seasons, say June and September. A British variety, Auchincruive Climax, may belong to this class rather than to that of the summer strawberries, where it is usually placed.

This grouping into three classes, or groups, is arbitrary, and other methods could be devised quite as good and in some ways more valid. For example, groups based upon wild ancestry—all the Hautbois strawberries in one, varieties of *F. collina*. But the method I have adopted is suggested by the plan of the book, this business of strawberry seasons, because, broadly speaking, all the strawberries in *Group One* bear best from May to July inclusive; all in *Group Two* from late June to late August; and all in *Group Three* from August to November. Thus they themselves suggest three seasons, and the varieties which we find within the groups also arrange themselves within those three seasons to form sub-seasons.

However, when I have discussed each of the above groups, with a view to making clear the notion 'variety', I deal, in this chapter, with another group which does, in fact, cut across all three: this is the group of Epicure's varieties, and names from the list can be substituted for the varieties suggested in each of the season chapters, by those growers who wish to place fine quality above all other attributes.

SEASON OR TIMING OF VARIETIES

Horticulturists commonly give ripening dates for varieties in the most open-handed manner, without considering that the dates vary with latitude, microclimate and other local factors by as much as a month. Whenever I mention a date in this book it is true for East Kent at an altitude of 350 feet and facing south, and for no other place or site. But the relative earliness or lateness of a variety by comparison with these attributes for another variety are fairly stable, although even in that case one must point out that a variety may find itself suited to a certain

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locality and perform differently and better there than one would expect of it in theory.

GROUP ONE

Varieties in *Group One* have in common the attribute of being ordinary, short-season, summer strawberries. They range in season from early June (for ripening) to late July, and in quality from such fine dessert varieties as *Royal Sovereign* and *Sulpice Barbe* to such inferior fruits as *Huxley Giant* and *Madame Kooi*, neither of which is worth growing. They are all large-fruited, but the actual size of fruit varies with variety and culture from that of a small damson to that of a large Victoria plum. Fruit shapes are diverse, but on the whole most varieties produce fruit which is conical-rounded, conical-angular, fan-shaped or simply lumpish and irregular. All these varieties, and there are probably several hundred, derive from a few progenitors about a century old—notably from Keens' seedlings, which were *F. chiloensis* hybrids. All the varieties in this group are octoploids. All produce more or less numerous runners. The varieties differ in their demands on soil, and the patient gardener can find one more suited to his garden than any other. There is no more foolish policy than that of growing one or two varieties all over Britain, as if *Royal Sovereign*, for example, were irreplaceable. A strawberry which tastes like the wrath of God in Surrey may taste like ambrosia if grown on Essex soil.

GROUP Two

The Alpine varieties are all the products of selection and not of hybridization, or at most of a simple cross between two diploid wild varieties, or between two selected clones. Consequently, unlike the Group One varieties, they come true from seed. This they have in common, as also rather small to very small fruit, a delicious and very strong perfume, a dry and light quality in the mouth, so that they require special preparation to be tasted at their best. They have an aftertaste of bitterness, very

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slight and agreeable, which is why they are called, by some epicures, bitter strawberries. Not all the varieties make runners: there is one sub-group which does; and another sub-group, all derivatives of the prototype *Gaillon* and bred from *F. eflagellis*, probably a sport of *F. vesca*, which bears no runners and therefore makes convenient edging plants. Despite small fruit, the plants of Alpine varieties are often large, or enormous, and the leaf-form of all within this group is finer, more pointed, 'wilder' looking than Group One or Group Three varieties. The fruit-truss stalks are very long, often sturdy and upright, carrying fruit clear of soil. Birds do not eat Alpine strawberries with much enthusiasm, probably because they are dry, for it is thirst, as much as hunger, which drives birds to raid strawberry beds. The colours and shapes of the fruit of Alpines are diverse, the former varying from greenish-white to deepest vermillion when ripe, the latter from button-shaped, through spherical, to long-conical. The white fruit are superior in flavour to the red, but the perfume of the red is incomparable.

GROUP THREE

The common attributes of all varieties in this group are the habit of continuous fruit production or repeated fruit production; and the large size of the fruit which distinguishes them from Alpines. What is the origin of the 'perpetual' habit? I try to discuss this later, but here it may be said that in view of the genetical improbability involved in cross-breeding an octoploid summer variety with a diploid *F. vesca* with its perpetual habit of bearing, the theory that perpetuals have been produced by *selection* seems the more probable. It is quite clear that several varieties of summer strawberries show a slight tendency to throw second fruit trusses later in the season; this is so marked with *Climax* that it is commercially valuable; but I have seen scores of plants of *Royal Sovereign* in the superbly cultivated plantations of my friend, Major Vyvian Mundy, near Falmouth, bearing flowers in late August. It is perfectly feasible that if such plants were selected from the beds, and their runners grown on,

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and autumn flowering individuals selected again, and so following for a dozen seasons, we should have a perpetual bearing *Royal Sovereign*. There is no doubt at all that many interesting horticultural improvements or novelties are missed because gardeners never think of isolating and studying a plant which behaves eccentrically. Yet it is to accidental sports that we owe the best fruit varieties rather than to scientifically bred varieties.

Of the perpetuals, it is often said and written, by those who have never grown them, that they 'make no runners'. In fact, although there may possibly be some varieties which make no runners, and there certainly are several—for example, *Charles (Géant) Simmen*, a superb strawberry, which makes very few—most perpetuals make quite as many runners as are convenient, and even more, although few of them produce such quantities as to be a damned nuisance, like *Royal Sovereign*.

The fruits of perpetuals vary in colour and shape to such an extent that this circumstance is probably an argument in favour of the hybrid theory of their origin. For example, I have never seen an ordinary summer strawberry which has the button shape of *Triomphe*, or of *Général de Gaulle*, perpetuals produced by Chapron and Maillochon respectively; but I have seen this shape in certain *F. vesca* varieties. In other varieties the fruit is enormous and shapeless, or more or less so; in others again it is very regular and conical or fan-shaped; *St. Claude* is the most nearly ideal strawberry in shape that I have ever seen, and *La Sans Rivale* closely resembles *Royal Sovereign*, but with a much better colour. *Red Rich* tends to be a mere lump, and so does another American, *Perfection*, although some of its fruits are shapely.

VARIETIES FOR EPICURES

This especial group of varieties, represented by a short and selected list, is discussed here for the benefit of the skilful gardener and epicure, the connoisseur of fruit who likes to treat his palate with as much discrimination as the music-lover treats his

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ear. Since the patrons of greengrocers' shops are uninterested in flavours, and buy fruit by the size and colour, it is probable that these varieties will be of little interest to the commercial grower. The amateur grower, however, may like to substitute some of these fine varieties for the more 'commercial' ones used to compose the long-season scheme which follows in the next three chapters.

Many of the finest varieties are old ones, lost to general cultivation but preserved by a few amateurs and nurserymen who respect quality above quantity. The gardener who plants these varieties must not expect to get the weight of crop he can obtain from *Huxley Giant*. Moreover, the best varieties will not succeed everywhere, and the gardener who wishes to grow them can only discover whether there is one which is at home in his soil, by trial and selection.

The brief notes following the name of each variety do not repeat, in each case, the qualification which applies to all in the list, and is indeed, the reason for inclusion in it: exquisite flavour, texture and perfume.

Bedford Champion

Oval. Medium to quite large. Bright scarlet.

Fill-basket

Said by many judges to be the finest English strawberry ever grown. Upon sampling it, and comparing it with modern varieties, the man or woman of sensibility may be led to question the whole concept of progress. It should therefore only be grown by the strong-minded or by persons over forty years of age. The plants are large to enormous.

Eliza Seedling

Another ancient variety, 'Whose memory', writes Major Corner, 'is treasured by all who knew it in its hey-day.' On the Continent, where flavour is important, this variety is being grown again. The fruit is small and dark red.

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Black Prince

Difficult to obtain but very rewarding. Quite large and very dark, almost black, it is either very early—and might be worth growing under cloches—or very late, suggesting the beginnings of a 'perpetual' habit. I have seen a bed of it, fully ripe, the colour of over-ripe raspberries, in late August. The flavour is as rich as the colour, winey, and almost like strawberries preserved in brandy.

Noble

Some of the earliest *F. chiloensis* crosses had, from somewhere, perhaps from Duchesne's early crosses, a flavour of pineapple which was much appreciated. *Noble*, one of Laxton's early successes, may have been bred from such a variety, although the pineapple flavour in it is slight and ephemeral. The fruit is medium-sized and bright red. Again, half-lost in Britain, France and Holland have preserved it for the sake of its flavour, and have bred from it.

The Duke

A bright scarlet, oval strawberry with orange flesh, comparable with *Bedford Champion* for fine flavour. A heavy and regular cropper.

For the gourmet's strawberry jam, there are two small, high-flavoured varieties from which a preserve can be made which bears no relation whatever to the curious glutinous substance sold in jars as Strawberry Jam, and made from strawberries and some unidentifiable grey pulp, possibly of vegetable origin. The two are:

Trollope's Victoria
Little Scarlet

Commercial strawberry jam is made, in so far as the small strawberry component is concerned, from *Huxley Giant*, a berry which looks exactly like a real strawberry but does not taste like anything, unless possibly sawdust.

VARIETIES IN GENERAL

In considering this list, and wondering whether it is really worth while to go to all the trouble of finding plants and substituting them for modern varieties in the garden, the reader will consider that the modern varieties, many of them excellent, have mostly been bred for qualities other than their flavour. There are, of course, honourable exceptions, even among the latest series, such as the Cambridge strawberries. But on the whole the *strawberriness* of strawberries is commonly overlooked by plant breeders, and varieties are bred for size, shape, colour, virus resistance, the power to travel and handle without damage. All these are good things but are beside the point of the man who wants strawberries as a means to exquisite sensation.

Take, for example, the case of *Little Scarlet*. Why bother with this variety? Because it will then be possible to taste strawberry jam, something very very rare in our time. It is quite unfair to manufacturers, as I have already made clear, to say that the curious and interesting red adhesive sold under the name of strawberry jam, in shops, contains no strawberries: it does, in fact, contain several. But they are *Huxley Giant*, and they are but few to the large tonnage of grey slime of unknown provenance. The resultant disesteemed substance is as different from strawberry jam made with *Little Scarlet* as cheap rayon is different from fine silk.

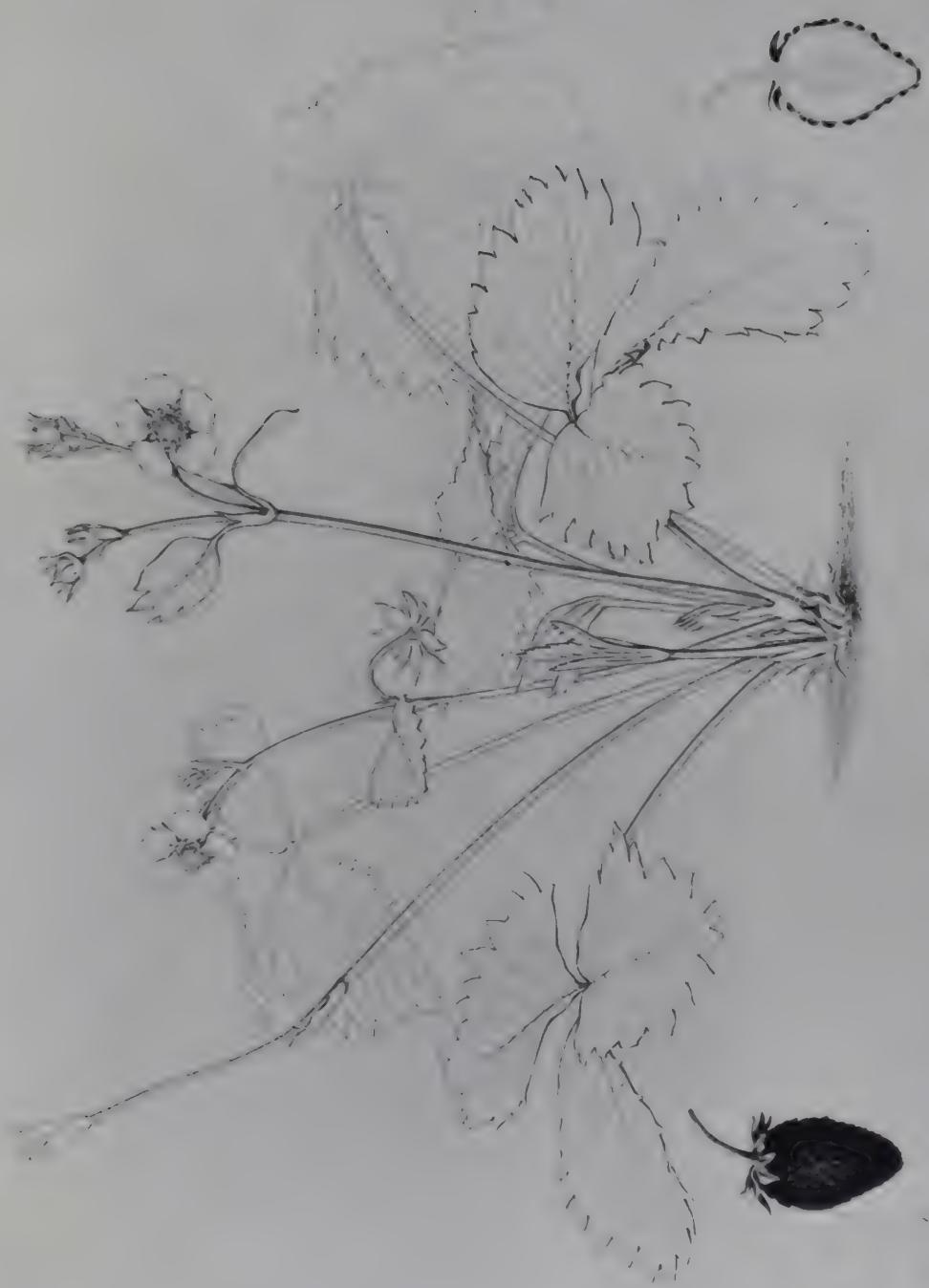
Since epicures are cosmopolitans, and like English apples, French wine, Russian caviare, Spanish women, Irish bacon, and American money, here are two of the finer French strawberries, still to be had from nurserymen of standing. The varieties have lost vigour, and the plants are liable to be sickly and weary creatures, but the flavours of their fruit are among the most exquisite.

Vicomtesse Héricart de Thury

Of medium size. Mid-season. Sweet and high-flavoured.

Sulpice Barbe

In heavily dunged and fertile soil, the good, above average strawberry. In certain soils, less rich, possibly the most straw-



F. DES ALPES

Fragaria des Alpes, from *Le Jardin Fruitier du Muséum*, 1857



Truss fruit of *Victoire* from the author's garden. The colour is rose-red

VARIETIES IN GENERAL

berry of all strawberries—the essence of the ideal strawberry flavour. Not a good cropper by commercial standards.

The next list is one of varieties which, while tasting of strawberry, possess an under-taste, a taste-equivalent of *chiaroscuro*, which may seduce and titillate the palate of the sophisticated, weary of simplicity.

White Pineapple

Medium size, whitish shading to pale rose. Can still be found in gardens of agreeable people. Tastes of pineapple as well as strawberry, and makes a delicious preserve.

Early Musk (Précoce Musqué)

Brand new and admirable; rich piney-musky flavour combined with the acid sweetness of *F. vesca*. Presumably there is *F. moschata* in the pedigree, although here again we are up against the old genetical difficulty. I am sure that this is a *Hautbois*, and the breeder claims it is, but some deny that this is possible.

Apricot

A large, bright crimson strawberry, firm of flesh and with mixed strawberry and apricot flavour. It is not easy to grow and will usually fail unless your soil and fingers please it.

Hautbois

This ancient and excellent variety is being reintroduced for its subtle strawberry-raspberry flavour. Like its wild ancestor it is musky, and it is highly aromatic, a most important attribute of a good strawberry.

The final epicure's list contains only varieties which are, or were, supposed to be perpetuals. The second is very hard to get. The first and third have proved in our garden to be not perpetuals at all, but summer strawberries, with a temperamental and casual habit of producing later second and third crops in short bursts. In their first year they are sometimes more or less

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perpetual. However, one cannot have everything, and these varieties are of very fine quality.

Libération d'Orléans

Neither a large nor a reliable cropper, but superb fruit. Berries large or very large, and the musky flavour has a touch of *Hautbois*.

White Perpetual

A Laxton strawberry. This famous firm now seems to concentrate upon producing *Royal Sovereign* with such large fruit that a sensitive friend, with me at the R.H.S. Show at Chelsea, described them as 'obscene', and turned away in horror. Elderly men, remembering Laxton in their greatness, cried *Eheu, fugaces!* or muttered concerning the passing of Babylon, that great city, and shed a tear. *White Perpetual* is as hard to grow well as it is to get. White to rose. Pineapple.

Perle Rouge

Spherical and pale red. The flavour is said to be that of the original *Royal Sovereign*. Our present fruit of that name lives on its past reputation and the inferiority of its rivals—like certain politicians. *Perle Rouge* will serve to remind you of what we have lost. But don't be discouraged; remember *Précocé Musqué* and some of the new Cambridge—although not the most popular—varieties; for, as Major Corner has pointed out to me, Mr. D. Boyes, who bred these new strawberries, has often used the best and most highly flavoured of the old varieties as progenitors of his new ones. If quality again occupies a place in strawberry gardening, Mr. Boyes will be the man to thank for it.

LIST OF VARIETIES NAMED IN THIS CHAPTER

Bedford Champion	Vicomtesse Héricart de Thury
Fill-basket	Sulpice Barbe
Eliza Seedling	White Pineapple

VARIETIES IN GENERAL

Black Prince	Early Musk
Noble	Hautbois
The Duke	Libération d'Orléans
Trollopes' Victoria	White Perpetual
Little Scarlet	Perle Rouge



V

THE EARLY STRAWBERRY SEASON

The gardener's year being circular, there can be confusion between early and late, especially as I propose to deal with growing strawberries right round the year. I have decided to call those strawberries *early* which are grown with glass protection but without heat, and those which are grown with the aid of heat and light, although perhaps gathered in March, will therefore be called *late*.

The subject of soil has been dealt with in its own chapter. Prepare a bed, or rows, of the requisite kind of soil correctly manured, in May or June, and rake into the surface a dressing of finely divided compost. It is always a mistake to bury compost; it is all the more so to do this when the plants are shallow rooted, like strawberries.

The beds should be planted early, in July if possible, but in any case not later than the first week in September. It is difficult to obtain the runner plants early enough unless you possess your own nursery beds (see Chapter X), but it can be done by persistent nagging of the nurseryman and by paying a little extra. Pot-grown, hand-set plants are worth what they cost, for the amateur; but, of course, the commercial grower could not afford them. The plants should carry a certificate of freedom from virus disease—its value is discussed in another chapter—but at the very least it will ensure you reasonably healthy plants from a plantation grown and rogued under Government inspection, which is worth a great deal—Government inspectors being disinterested and conscientious persons. When buying plants it is desirable to obtain the first, second or third on

THE EARLY STRAWBERRY SEASON

a runner, rather than the twenty-fifth: it may well be true that the tip-runner plants are potentially as good as the others, but they are usually small and backward during the first year.

If planted in July-August the plants should be set about fifteen inches apart in rows three feet apart. Some growers have alleys only two feet wide, which increases the yield per acre; it also increases the incidence of botrytis, and makes the whole field about ten times as difficult to work. As the strawberries are to go under cloches, it is also possible to plant double rows, but in the case of summer-planted strawberries, with ample time to grow, this practice so crowds the cloches with foliage as to impede ventilation and create good conditions for the development of strawberry mildew and botrytis. But in the case of later planting, which some cloche growers favour in any case, double rows of all varieties but *Royal Sovereign* will yield increased crops. *Royal Sovereign*, when healthy, is too big a plant for double-row planting. The double row has to be within twenty inches, the width of the cloches.

Once the plants are in and growing—say in August—it is necessary to keep the soil watered, hoed and free of weeds. In light soils a very heavy watering at the time of planting, followed by heavy mulching with rotten straw or compost, is advisable. It is necessary that the plants be kept growing, and they will not grow if they are dry. But, in good conditions, they will keep growing until the light fails—late in October—that is when the day gets too short for them; or until the early frosts, in cold regions.

It is generally held that when planting strawberries the crown of the plant should be kept high. To achieve this, take out a hole with the trowel, make a ball of soil by squeezing a handful; put this into the bottom of the hole, stand the plant on it and spread out its roots so that they are like the fingers of a hand grasping a ball. Then fill in the hole and press the plant in tight with the fingers, putting the knuckles on each side of the plant and throwing your weight on them. Strawberries grow well if firmly planted; they like a holding soil better than a loose one,

THE EARLY STRAWBERRY SEASON

and so the subsequent hoeing, to make all tidy, should be light and superficial.

The above is orthodox. I have this to say of it: I have had excellent results by dibbling the plants in with about as much trouble as if they were cabbages. And as to planting high: if you do, especially in heavy soil, the frosts will lift half of your plants for you, and you will not notice what has happened until they are dead. Monsieur Charles Simmen, the great French *fraisieriste*, and raiser of *Géant Simmen*, *Record*, and other splendid varieties, says high planting is all nonsense. In his edition of Lesourd's *Le Fraisier*, he writes: 'We must confess that after forty years of practical experience and trials, which we believe to be vindicated by our results, we are in total disagreement with all the manuals on the correct way of planting a strawberry well.' Monsieur Simmen adds that the method illustrated in the said manuals, showing a plant with the crown in the soil, almost in a hollow, and generally captioned *badly planted*, is actually by far the best method, and, says he, good Frenchman that he is, 'logically so'.

The strawberry plant very readily produces adventitious roots of value to the plant. Moreover, the plant suffers serious damage if its roots become exposed. Therefore, says Monsieur Simmen, you should plant strawberries in a hollow, with the soil well up to the crown. Thus planted, they are better protected against being loosened and raised by frost. Moreover, should any falling away of soil tend to bare the upper roots, the first hoeing of the season, by filling the hollow, re-covers them.

My own opinion is that Monsieur Simmen is right on light and medium soils, wrong on heavy, paning soils. In the latter case, the hollow may fill with water and the plants rot at the collar. Otherwise, and if this danger can be avoided, then Monsieur Simmen is right and all the other pundits wrong, as any grower can prove to his own satisfaction by trying both methods side by side.

Newly planted strawberries growing away well will throw runners, which must be removed as soon as they appear. Thus the regular autumn routine will be:

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- i. Inspection and removal of runners.
- ii. Cultivation.
- iii. Watering when necessary, after 3 p.m.

By the time of the first frosts the plants will be large, bushy, with one or more stout crowns and the leaves a bright green.

Late-planted plants can be cloched in November, in an effort to prolong growth for a week or two, but this will only be effective if the season is sunny. But do not leave the cloches on throughout the winter in a mild season. The topsoil will dry out; but, what is more important, unless your plants feel a touch of frost, the crop will be reduced. Cold is required by strawberries to harden them, to age the plants correctly so that flower trusses are produced; and, as we shall see, when it is required to grow winter fruit, an artificial winter has to be contrived earlier in the year. It was demonstrated, over half a century ago, that hot-house plants crop better, and the number of barren plants is much reduced if the plants are given a week or ten days' cold before going into the hot-house. In the same way, a period of short days is necessary.

Final cloching should take place about the middle of January or early February. The cloches can be removed on a warm day in April, early, and the soil cultivated. Or, better still, do this in March, and carry out spring manuring according to the plan already suggested, at the same time.

THE CLOCHEs

Many types of cloches or glass cover are suitable. I use continuous cloches. When the plants have been set in July-August, or when the variety is *Royal Sovereign*, or when double rows are planted, I think that tall barn cloches are more satisfactory than growers' barn, or low barn. But all kinds are used. Where maiden plants have been set as late as October, in single rows, then low barn or even tent cloches can be used, as the plants will never attain full size. Many growers prefer this method, as they then get little foliage, and if the quantity of fruit is not great it is of good size and well exposed to light and air.

THE EARLY STRAWBERRY SEASON

It is better to place cloches in close contact, and use the ventilation slots for providing air, than to leave gaps between the cloches, hoping that drafts and ventilation are the same thing. They are not. In cold weather ventilators remain closed day and night, but they should be opened whenever possible, and always on warm days. If the March weather is mild and wet, it may pay to remove the cloches altogether for a day, and allow the plants the benefit of rain. But this is troublesome and not at all necessary. Watering becomes necessary in late spring and early summer. Growers not accustomed to cloches should watch the soil under cloches quite self-consciously, or it may dry out and the plants will then flag, which is bad for them. The amount and frequency of watering is a matter of soil texture, and of judgement. Clay with good compost treatment never dries out badly. Weeds must be kept down.

Cloched strawberries of early varieties will flower about the middle of April or a little earlier. As soon as they flower bees must have access to them. Wild bees work in almost all weathers, so that cloche ventilators should be opened even in rain, and despite the absence of hive bees. In very warm weather the end glasses of the rows can be removed to get a good through draught, and even some of the top panels entirely removed where the type of cloche used permits of this. (Temperature under cloches which are closed can, in spring sunshine, rise too high: I have measured 95° on occasions.)

In soils which dry out, watering should be continued during flowering and until the greater part of the fruit is set. It should stop whenever possible, however, for too much water spoils the quality of the fruit, while increasing its size. Where possible, some arrangement should be adopted whereby water is conveyed to the roots of the plants without wetting the foliage or fruit, and keeping the soil surface dry. Otherwise the risk of botrytis and mildew are increased, and in any case fruit will get dirty, for strewing, under cloches, is exceptional.

THE EARLY STRAWBERRY SEASON

STREWING

I have strewn strawberry beds under cloches; and I have left them unstrewn; and my conclusion is that strewing is neither necessary nor desirable. For most of the time the surface soil is dry and the fruit can rest upon it without getting dirty. Strewing is troublesome and, on a large scale, expensive. It makes a mess; it may cause nitrogen starvation in the plants; straw harbours slugs and even mice; it impedes cultivation, although keeping weeds down; and it lowers the temperature inside the cloches. By the same token, it delays the ripening of fruit, for since it presents a light-reflecting surface to the sun, it throws off warmth instead of absorbing it: the ideal surface colour for a ground fruit crop such as strawberries or melons, is black, and if black straw were available it might hasten ripening. As it is, do not strew cloched strawberries.

GLASS ON THE GROUND

At the Coronet Perpetual Strawberry Plantations I saw the following method in use. Broken glass, collected during years of normal cloche breakages, was used to cover the soil about strawberry plants. This greatly increased the rate at which soil warmed up in the spring, and gave unprotected plants a decided lead on control plants which had not been helped in this manner. It would appear that soil warmth is a very important factor in considering the early crop. Incidentally the glass kept down weeds and provided a clean surface upon which the fruit could rest. There is no reason why this method should not be used under cloches, as well as where no cloches are used.

FROST

On all English sites excepting those above an altitude of about three hundred feet, reradiation frosts on still, clear nights in April and May are common. The flowers of strawberries will

THE EARLY STRAWBERRY SEASON

stand about 4° F. of frost without suffering damage, but 5° is enough to kill the central and vital organs of the flower, whereupon that part turns black after the sun has touched it on the following day, and no fruit develops. Cloches provide very considerable protection against loss of heat by reradiation from soil and plant. The difference in the temperature inside cloches at night exceeds 5°. It follows that even when the temperature falls to 24° F. outside the cloches, the strawberries in flower beneath them will be safe. The temperature very rarely does fall below that figure in April or May, but it can do so, and if it approaches that figure, the amateur grower with a few rows of plants, forewarned by the B.B.C. to keep a sharp eye on the thermometer, can cover the cloches with sacks or brown paper or even newspaper, and save his crop. The commercial grower is more or less helpless: one cannot cover an acre of cloches with sacks in a few minutes, even if sacks were available. However, the commercial grower who has his strawberries in a frost pocket deserves to lose them.

To conclude, the chance of frost damage to strawberry flowers under glass is small, and I can recall no case of serious loss from this cause. Frosts of five or six degrees are of no consequence at all to the grower who is using cloches, or frames.

THE EARLY HARVEST

Early varieties of cloched strawberries begin to ripen in the first week in May, and fruit will be picked during three to four weeks. For the amateur gardener whose crop is consumed at home, this will mean merely that an annual pleasure is brought forward and prolonged by about five weeks, and that his pride as well as his palate will be indulged.

For the commercial growers, of course, May strawberries are one of the few hopes he has of making a profit out of his garden, so that it will be worth while to say something here about marketing.

It is impossible to say what the price will be, for certain: by the time this is printed the politicians, economists, soldiers and

THE EARLY STRAWBERRY SEASON

industrialists, working in their usual unholy alliance, will perhaps have reduced the £ sterling to ninepence, abolished horticulture in England, or banned the eating of strawberries as a serious interference with the rearmament plan. The figures given here are based on the immediate past and are comparative.

Very early strawberries, being expensive, must be graded, and some market dealers help the grower and themselves by providing flat, wooden boxes, known as 'squares', for the fancy packing of the finest fruits. This fruit, known as extra-selected, is the largest, most shapely, flawless; it will be picked when the point has ripened and the colour is spreading well down towards the base. It will be handled only with dry, clean hands, and by the stalk, a good half inch of which should be picked with the fruit, being nipped off with the thumb-nail pressed against the pad of the index finger. The fruit will be laid on clean, white paper, on a bench in the packing shed, no fruit touching another. There it will continue to ripen, or at least to turn red. Real ripening is another matter, and for the grower who wishes to eat strawberries at perfection, the fruit should be left on the plant until it is fully and deeply coloured and fragrant: it is then ripe and fit to eat; but that has nothing to do with trade.

The 'squares' are lined with quilted shoddy or something similar. This is covered by the grower with fresh, clean and dry strawberry leaves. On this base the strawberries are packed in geometrically neat rows, as nearly as possible of one size, shape and colour. They are then covered with a layer of quilted wadding and with the wooden lid provided with the 'square'.

Extra-selected fruit packed in this way has brought the grower a return between 12s. and 16s. a pound from which freight and commission must be subtracted, leaving the grower between 8s. and 10s. Provided that the packing is done by members of the grower's family for nothing, or, if by paid hands, is done swiftly and conscientiously, the grower will, at these prices, make a profit.

Selected fruit, just below the extra-selected in size, but equally flawless, should be packed in the same manner. The modern housewife of the middle and upper classes loves wasting money on packing: in the first place she has been conditioned to do so

THE EARLY STRAWBERRY SEASON

by advertisements ; in the second, it is American, and therefore admirable. Recently, when my publisher was trying to print a new edition of one of my books and therefore trying hard to buy paper, I was offered, in my hardware shop, a mousetrap packed in an expensive carton of fine white cardboard, for which I had, of course, to pay. The housewife will pay a great deal for fruit if it is tarted up in fancy packing, which she will reject entirely if it is sold loose. Perhaps she thinks it is imported, if it's in a box. At all events, it undoubtedly pays to indulge this foolishness.

Strawberries of dessert quality but not of the two top grades, are sent to market in punnets of wood, or chips as they are called in Kent. One pound are preferable to the two pound, and cheaper, as they have no handle. They cost about 1s. 9d. per dozen in small quantities, and less in large quantities, and being non-returnable must be allowed for in costing the crop. In May this fruit will fetch about 4s. to 5s. a pound. Towards the end of the cloche season—say in early June—the grower begins to watch the market price lists for the dip which heralds the first arrivals of imported strawberries from France or elsewhere. It is useless to trust the politician's promise that imports will be held back during such and such a season, as he will probably change his mind at a day's notice and without warning a soul—perhaps he has a brother in the business, or his wife has nagged him about the price of fruit: at all events, he is, by definition, irresponsible. So watch out. In some years, but less often than one might expect, the outdoor west-country crop may spoil the end of the market for the east and midlands cloche grower. The point is that once the price has come down to the figure at which the non-cloche grower can sell strawberries, then the grower who still has fruit under cloches will lose money on it, which may not matter if he has cleared himself during the preceding weeks. Now, this means that earliness is vital—a day or two's start on other growers may make all the difference. Here, then, before coming to the question of varieties, are the factors making for earliness, summed up in a list :

1. Site and aspect : full south or south-east with, if possible, a slope to the south. The higher the better, up to about 400 ft.

THE EARLY STRAWBERRY SEASON

2. It is generally supposed that early planting of early runners will give early fruit. But this seems to be contrary to the experience of many growers, who say that plants set in October, for cloche cultivation, fruit earlier than plants set in August. The difference is perhaps not significant, and seems to be local and seasonal. A proper piece of research on this is called for.

3. Selective propagation. This applies where the grower has his own nursery beds. It will be noticed that within a single variety, even a single clone, some plants are earlier than others. If the gardener is careful to take runner plants for his early season only from such plants, and to continue selecting runners from early plants year after year, he can build up a strain of extra-early plants of any early variety, which will be his own exclusive property.

4. Planting of maiden plants. These are earlier than two-year-olds. The reason is obscure.

5. Early cloching—mid-January.

6. Soil-warming by the method of laying broken glass on the soil all round the plants.

VARIETIES FOR EARLY SEASON

*Reine des Précoce*s (Chapron 1937). Vigorous and disease-resistant. Large, handsome, oval fruit, bright red and of excellent quality. Admirable under cloches.

Hâtive de Caen (Gauthier). Vigorous and bushy, medium-sized fruit of good shape, deep rose-pink. High quality, fine perfume. Matures very rapidly.

Surprise des Halles (Guyot 1929). Bushy, sturdy, hardy. Trusses held clear of foliage. Large, conical, deep red berries. Fair quality, very large crops maturing rapidly and with all the commercial qualities.

Cambridge 173 (named by some nurseries with their own names) Large leaves, open habit, rather weak growth. Fruit of good colour and shape, marketable. Quality fair, rather insipid. Double rows under cloches.

THE EARLY STRAWBERRY SEASON

Cambridge 420 (named by some nurseries with their own names)

Very early, good shape and colour fruit, of only fair quality on low, open plants. Easy to cloche—double rows.

From the epicure's list: *Little Scarlet*

VI

THE MAIN STRAWBERRY CROP

The mid strawberry season is defined for the purposes of this book by the limits of the period during which the ordinary, large, summer strawberries ripen, that is two months, from about June 15th when the cloches season begins to end, and August 15th, very approximately, and conditioned by latitude, altitude and season.

The mid-season is then divided into three seasons, or sub-seasons, to each of which is allotted its varieties of strawberry plants. Where possible, the beds or fields for each of these periods—June–July; July; July–August—should be given a special aspect, an orientation tending, by taking advantage of the micro-climate, to emphasize the earliness or lateness of the variety being grown.

But for all three mid-season periods the management of the plantations is identical. I shall therefore deal first with this subject in general, disregarding the time and varieties, and describing two different methods of proceeding. Subsequently, I shall discuss the influence on the date of ripening of the variety chosen and the aspect of the beds.

METHOD ONE

This method of maintaining strawberry beds is more suitable for small and amateur plantations than for large-scale growing. It entails the maintenance, by the gardener, of his own strawberry nursery, concerning which the reader is referred to Chapter X.

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The beds for strawberry plants must be prepared in May or June according to the principles suggested in Chapter II. Planting must be done in July or August, but in any case as early as possible, that is as soon as the runner plants in the nursery are well rooted, a date which will depend very much on the care which they have received, and especially on adequate watering; and which can be brought forward into June by the careful gardener.

The rows of plants should be set at least 2 ft. 6 in. apart, and the plants from 12 to 24 inches apart in the rows, according to the size which the variety is likely to attain in your soil. Eighteen inches is a safe average. The East Malling range of *Royal Sovereign* clones needs at least 18 inches and preferably more. Most Cambridge varieties can manage with 15 inches. Massive varieties, like the French *Hercule*, need two feet. At least one variety, but it comes in the late season, needs a yard each way.

The method of planting was discussed in Chapter V and need not be repeated here.

Once a week after planting go over the beds and remove young runners by nipping them off with the thumb-nail near to their origin. Keep the beds clear of weeds and the soil lightly cultivated to a depth of not more than an inch near the plants. If there is a period of drought, as happens in August and September from time to time, water the young plants or they will stop growing. I do not care for overhead watering of strawberry plants, although it is unavoidable in large plantations where an artificial rainer is used. The small gardener should use the following method: draw out a shallow ditch with the Dutch hoe on each side of each row of plants and three inches from the plants. Fill these temporary irrigation trenches with water until they overflow, that is until the water no longer readily sinks into the soil. Then fill in the ditches and rake over the surface. By this means water is supplied to the roots, conserved, not allowed to cake the soil-surface or to be lost by evaporation.

By the end of the growing season, late in October, the plants should be well-grown. Tidy the beds for the winter by removing any runners overlooked, cutting off dead leaves and digging up



Royal Sovereign from the author's garden, on a 1" grid



Variety *Charles Simmen* from the author's garden. The core is soft. Actual size: a singleton

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and destroying dwarfed, warped or otherwise flawed plants, which should be very few, if any at all, excepting where *Royal Sovereign* is the variety, in which case diseased plants may be numerous.

Carry out the manuring programme suggested in Chapter II. Give a shallow hoeing each side of the rows and between the plants, leaving the soil rough, and dig down the centre of the alleys, leaving the soil in lumps, not in a fine tilth.

In March the plants will begin to grow again. They will be well forward in new leaf by April. The soil can be hoed down to a rough tilth. Late in April and in May, flowering begins and continues, and also the production of runners. Remove these runners regularly and rigorously. In heavy and in medium soils weeding should be thorough; in very light soils, in which strawberries will not grow unless the organic manuring has been very heavy, some weeds are actually a help to the plants.

In May flowering begins, and also the growth of runners. Be rigorous and regular in removing these. When going over the beds for this purpose, inspect the plants for pests and for symptoms of virus disease and remove and destroy diseased plants, replacing them from the nursery if any young plants remain there. These transplanted replacements should have the flower bracts removed, and are for fruiting in the following season.

FROST

In the early season, frost was not considered of great importance, as the flowering plants were protected by cloches. In the case of unprotected plants there is always a danger of total loss of crop, a frost of five or six degrees Fahrenheit being enough to kill the vital organs of the flower if these are subsequently exposed to the sun, which they must be. The damage will not, in fact, appear until some time after the morning sun has been shining on the plants, when their centres will be seen to be blackened.

There is considerable difference in the susceptibility of varieties to frost damage and some varieties are actually listed by the

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French as immune. The difference is probably not so much due to any special hardiness or want of it, but rather to the different growing habits of varieties. Those with leaves which tend to grow outwards, or to fall low by reason of weak stems, offer their flowers no cover, so that damage in the case of frost in May will be severe. Varieties with sturdy stems and an erect habit, and with short flower bracts often cover the flowers with the leaf, and many flowers escape damage.

The period during which the strawberry grower undergoes nightly agony of mind is from the beginning of May until about May 20th, after which he is usually safe. The commercial grower, unless he can apply the principles of frost protection set forth in East Malling's Pamphlet No. E.352, can do nothing to protect his plantation, by reason of its size. Therefore no strawberry plantation should be low, or in a hot-spot; and where possible planting should be above the frost level. But the amateur grower, forewarned by the B.B.C., by the local wiseacres and by his own *nous* can take steps.

It is a remarkable fact that almost any obstacle, however trifling, interposed between the plants and the open, clear sky into which precious calories from soil, plant and lower atmosphere are being radiated, will check the loss of heat to which ground frost is due. A sheet of newspaper—*The Times*, oddly enough, being warmer than either the *Daily Worker* or the *Daily Mirror*—is effective as protection.

The gardener will have provided himself with fishnet for use against birds when his fruit begins to ripen. By the driving in of a system of short, stout stakes, and stretching between them a grid of taut wires, he will also have some support on to which the nets can be spread and clipped with bulldog paper clips. If this anti-avian device is put in place as soon as the plants begin to flower then, when frost threatens, newspaper weighted with a few stones can be spread on the net and the flowers will be safe against all but the very rare severe frost. In fact, the net alone will, improbable as it may seem, afford some protection, a nice demonstration of the validity of claims made by cellular under-wear manufacturers. It happens that May frost nights are by

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definition windless, so that they are about the only nights in the year when newspaper *can* be spread out in this way. It must, of course, be removed in the morning. This method not only protects the strawberry flowers, but provides a justification for spending three-ha'pence on a newspaper, a long felt want.

The maiden plants of a first-year plantation will produce many single flowers, giving rise to prime fruits, and a few trusses of several flowers, giving rise to secondary fruit, equally good, but smaller. The crop will be only moderate in weight.

STRAW

It is generally assumed that strawberry beds must be strewn. Strewn should be avoided when it is possible, but this is rarely. Straw keeps the fruit clean and tolerably dry, and it is therefore necessary even though it carries weed seeds, harbours slugs and mice, may cause a local nitrogen famine, is troublesome to put down and untidy when in place; if put down before the fruit is set, it increases the danger of frost damage. The amateur grower can avoid using straw—for example by covering the soil with bits of broken glass pushed under the plants, thereby warming up the soil also. However, as a rule strewn is unavoidable on all but light sands, which grow poor strawberries anyway. Short, barley straw should be used, tucked well in under the plants and trodden flat. Too much is worse than not enough. The straw is laid parallel with the rows, of course, the worker putting it down and backing away from it as he, or usually she, tucks it in.

The commercial grower will pack his fruit in one- and two-pound chips or punnets, the fruit being graded for size—the selected put into the one-pound and the truss fruit into two-pound packs. Packing in 'squares' is probably not worth while even with the best fruit, at the height of the season.

After harvest the straw is removed to the compost heap, also the runners and dead leaves; the soil is cultivated, unhealthy plants removed and replaced; in fact all should continue as before the crop, although, as a rule, from August to December strawberry plantations are to be seen lost in a jungle of weeds. With the onset of winter and manuring time, the alleys can be

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dug down the middle, but not near the plants. This digging should be left rough and, as we say in east Kent, even clytey, so that frost and rain can penetrate, giving that invaluable natural cultivation which is a great ally of the good gardener.

Some commercial growers practise burning off the strawberry fields the moment cropping is over. The straw is raked away from immediate contact with the plants, into the alleys. Then, in dry weather and with the wind down the alleys, a match is set to the straw in each valley. The fire travels swiftly down the alleys, and straw, weeds and the old foliage of the plants, including any insect pests about, are all burnt off. The alleys are then cultivated.

In theory, and usually in practice, no damage is done to the crowns of the plants which soon break into fresh young foliage, and thus benefit from the burning off, while cultivation, whether with tines or a rotary cultivator, is facilitated.

But there is much to be said against this practice and I have heard one of the principal Kentish growers say it with great emphasis, while another was defending burning off with equal warmth. It is wicked to burn straw, the raw material of humus; it ought to be turned in, not burnt. But in that case the plants do not receive the benefit which comes from the destruction of their old foliage, runners, etc., and results in fresh foliage. To cover this point there is an American practice increasingly used in parts of Britain. As soon as cropping is over, the whole top of the plant is cut off, with a brushing hook or sickle. The material removed is raked into the alleys and turned in with the straw, and in due course the shorn plants break into fresh growth.

This is a practice which can be recommended, and it is certainly preferable to burning off. I have even heard of sheep being turned into strawberry fields to graze off the old foliage, but I have no knowledge of such a practice.

In the following season and again in the third year, the care of the beds will be the same as in the first year. In the second season the crop will be heavier but there will be more truss fruit than singles, the berries will be smaller and less regular in shape. In the third season this tendency to degeneration is more marked

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and after the third crop all plants which are three years old, that is all but transplanted replacements, should be uprooted and destroyed, the bed dug, heavily manured with compost, dried blood and bone, or according to the principles set forth in Chapter II, and the bed replanted from the nursery stock. A still better practice, if it can be managed, is to dig up and destroy all the plants in the old bed, devote that space to some other crop, and remake the strawberry plantation elsewhere. A crop of potatoes can be grown in the old place, followed by one of peas, and it can then be replanted to strawberries after a new manuring. But if it, the old space, is to be used as a strawberry bed again, after a couple of years, then no such gross feeders as brassicas should be raised in it, only potatoes, turnips and legumes, or flowers.

The replanting, whether on the new or the old site, should be carried out in July/August, so that the new bed can be cropped in the following summer, and no year lost.

METHOD Two

This method is suitable for commercial plantations, for large gardens with extensive strawberry beds, or wherever it is impossible to maintain a strawberry nursery, and where plants must be bought in. As it is difficult and expensive to do this early enough for cropping the following summer, this method is designed to procure a crop every year despite the necessity for autumn planting of young stock.

Divide the area to be planted with a particular variety and for a particular season, into three plots, which we will call A, B and C. Taking the year 1953 as a point of departure, plant up plot A in September or October, but not later, of 1953. Carry out the routine of care as described in Method 1. But in the spring, when the plants flower, pick off all the flower bracts and allow no fruit to form. Continue with care and cultivation as before.

In September/October 1954, plant up plot B, with the same variety and treat it in the same way.

Plot A will bear its first crop in the summer of 1955 and it should be good in all respects, since the plants should now be

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very large and, if healthy, capable of bearing more heavily than plants cropped in their first year. After harvest, treat the plot as in Method 1. In the same summer, 1955, plot B will be de-blossomed, but it will carry its first crop in 1956, while A is carrying its second crop. Meanwhile in the autumn of 1955, plot C has been planted up, and in the following summer is being de-blossomed; and in the following season while plot C carries its first and best crop, plot A carries its third and last. Plot A is then cleared and replanted with new stock, or it is remade on a new site, which is preferable. Here, set forth in a table, is the whole system.

<i>Year</i>	<i>Plot or Field A</i>	<i>B</i>	<i>C</i>
1953	September Plant up		
1954	April/May Remove flowers	September Plant up	
1955	June/July Crop	April/May Remove flowers	September Plant up
1956	June/July Crop	June/July Crop	April/May Remove flowers
1957	June/July Crop September Replant	June/July Crop	June/July Crop
1958	April/May Remove flowers	June/July Crop September Replant	June/July Crop
1959	June/July Crop	April/May Remove flowers	June/July Crop September Replant
1960	June/July Crop	June/July Crop	April/May Remove flowers

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Gardeners who buy strawberry plants instead of raising them in their own nursery should deal with a firm of repute and should get plants carrying the Ministry of Agriculture's certificate of health. The value of this certificate can be and often is questioned; but it certainly possesses some value, for it means at least that the young plants come from a carefully inspected, sprayed and rogued plantation, and if, nevertheless, they turn out to have among them infected individuals, these will be fewer than in the case of uncertified plants.

So much for the management of the plantation. We come next to the question of varieties and aspects, by the choice of which the strawberry plants to be cultivated in the manner described fall into three ripening seasons, to wit :

- (i) June 15th to 30th approximately.
- (ii) June 30th to July 25th approximately.
- (iii) July 20th to August 10th approximately.

(i) THE FIRST PERIOD OR SEASON

Aspect

To emphasize the earliness of this 'period', the varieties in question should be planted with a full southern exposure, and preferably in ground sloping gently downhill from north to south, or from north-west to south-east. The wet western winds which prevail all over the British Isles are disliked by all fruit plants, and a south-eastern exposure, even though it may be colder than a south-western one, is usually preferable.

Varieties

These will be the same as those planted under cloches, for the early season, and it will therefore be enough to recall their names without repeating their descriptions :

Cambridge 173
Cambridge 410
Reine des Précoce
Hâtif de Caen

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In addition to these four, three others of interest may be tried, first in the open and in a subsequent season under cloches. They are not included in the short list because although in some respects superior to the chosen varieties, they have been found to be much fussier about soil and microclimate, and do not seem to flourish everywhere indiscriminately.

Aurora Hâtif. This is an average-sized plant, remarkable for its healthy foliage. The crop is moderately large and the berries medium to large, regular and a good colour. Flavour excellent. The great advantage of this variety is the rapidity with which the fruit forms, grows and ripens.

Hercule. Very fine flavour, very large fruit, in copious quantity, very early, on enormous plants. Almost as susceptible to virus as *Royal Sovereign*. Often produces an autumn crop.

Précoce Musqué. An extremely early variety with good growing habits and medium to large fruit of the delicious, musky, *Hautbois* flavour. Monsieur Simmen, who raised this variety, says that it is in fact a cross between a 'large-fruited' and an *Hautbois* variety. Geneticists might declare this impossible, but the strawberries taste as if it's true.

THE SECOND PERIOD (June 30th to July 25th)

Aspect

To emphasize the lateness of the varieties to be planted, relative to the above group, the following can be planted with an eastern, or even south-western exposure, excepting in the West Country, where heavy rainfall may bring with it fungus trouble if the plants are too open to the south-west winds.

Varieties¹

Royal Sovereign (an East Malling clone, say 40 or 48). When healthy the plants are very large, tall and of a brilliant green.

⁴ The pernicious system of Central Markets in Britain puts a premium on certain varieties and the commercial grower is more or less forced to conform. At the moment the fashionable varieties are *Sovereign*, *Perle de Prague* (Lord knows why!) and *Climax*.

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The crop is medium to large, the berries very large and shapely on maiden plants, medium to small on older plants, and less shapely. Accommodates itself to a wide variety of soil and resists both drought and wet. The flavour of the fruit, without being among the best, is excellent, although Lesourd, in *Le Fraisier*, only concedes it a *good* and regards the variety as a commercial, not an amateur's, strawberry. But the variety has disadvantages, the worst of which is its extreme susceptibility to debilitation by five kinds of viruses, a complex which produces yellow edge, mild crinkle, severe crinkle, dwarfing, and what have you. The variety cannot be grown at all where other varieties are cultivated because of this weakness, and even certificated plants grown in isolation are liable to collapse. On the whole, we have decided that this variety is more of a nuisance than it is worth, and abandoned it.

Cambridge Seedlings. Of the numerous Cambridge seedlings few are good and all seem sensitive to virus, but some are of high quality, the best being the pine-flavoured varieties. Commercially, Number 422 is good. For the amateur who wants well-flavoured fruit, Nos. 632 and 641 are better, in the *Royal Sovereign* class, and claimed by some to be better. The work of breeding new varieties has passed to the John Innes Institute, and we can expect some super-Cambridge varieties in due course.

Sir Joseph Paxton. This variety is for heavy soils, but it is difficult to find a good strain. It is vigorous, with dark foliage and crimson fruit of good flavour.

Docteur Morère. Big plants with a fine healthy air. It will not grow if there is a suggestion of chalk, being very susceptible to chlorosis. Single fruit is very large, heart-shaped or fan-shaped, of good colour. Flavour and perfume—superb.

Madame Moutot. Included here on the probably inadequate grounds of being the largest strawberry known to science. As a cross between *Royal Sovereign* and *Dr. Morère* the flavour ought to be good, whereas it is poor, but the fruits are far larger than those of either parent, lumpish in shape, and of fair colour.

There are very numerous other varieties, but there is no point

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in listing them all. Certain varieties superior to those in the list in all but the weight of crop can be substituted by the gardener who wants quality above all, e.g. *Sulpice Barbe*. Other varieties have been left out because, like the superfine *Vicomtesse Héricart de Thury*, it is almost impossible to find a healthy strain; or, like *Ville de Caen*, virus debility makes them impractical. One which might have been added to this middle list is *Muscade*, equivalent to *Précoce Musqué* in the earlier list. 'Muscat' strawberries may become as well-considered as Muscat grapes, in the future, and *Muscade* is one of these.

THIRD PERIOD (July 20th to August)

Aspect

The gardener's object with the following varieties is to keep the crop back and get it as late as possible. The aspect should therefore be *northerly*. The idea that fruit will never ripen with a northerly exposure is erroneous. It will ripen late. I get superb *Golden Gages* (Oulins) of exceptional size and flavour off a north wall which never gets a glimmer of direct sunshine. They are, of course, late, which is an advantage. At East Malling Research Station, one of the buildings is planted to pears on all four walls, and the fruit of all these splendid giant cordon trees ripens. Strawberries will ripen late if exposed north, but they should not be planted under tree shade, which is not the same thing at all.

Varieties

Bedford Champion. See epicure's list. Do not expect large crops.

Auchincruive Climax. Medium-sized plants, with a fair crop of medium-sized but very shapely and regular fruits of a fine scarlet colour, which helps them in the markets. The flavour is fairly good—not up to *Sovereign*—and greatly inferior to the best. The variety has a good name as to virus and resists Red Core, but it seems that it suffers from some genetical instability touching the chlorophyll control, so that it is liable to turn completely yellow and die. The trouble is not so common as to make the variety

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useless, of course, and for commercial plantations *Climax* would be preferable to *Royal Sovereign* if only the flavour were better. The variety produces crops in flushes all through the season, if properly encouraged, and nearly always a large autumn crop.

Eleanor. If you can find it—large, rosy pink fruit, conical and of excellent, acid flavour. Exposed to the north and in clay soil will not ripen until July and continues well into August.

Etter. Not tried by me, this Australian strawberry is said by my French informants to be very late and very good, resistant to all diseases.

Tardive de Léopold. Vigorous, large plants, large berries in great number, brilliant red and of excellent flavour. Very late. The variety is not self fertile, having only pistillate flowers, and must be planted in association with another late variety, although as its lateness is rather a matter of slow fruit maturing than late flowering, *Royal Sovereign* will fertilize it. Another pollinator, also very late, is *Jucunda*, an old English variety, very late, remarkably sugary but rather insipid.

Other late varieties, if you can get them, are the very deep purple *Black Prince*, and the rather similar *Waterloo*. Laxton's *The Latest*¹ is probably later than *Tardive de Léopold*, and equally late, by all accounts, was *Myatt's Prolific*¹ also known as *Wonderful*.

¹ Both out of cultivation today, however.

VII

THE LATE SUMMER SEASON

ALPINE STRAWBERRIES

Since many varieties of Alpine strawberries produce ripe fruit from June to September ; since, also, as we have seen, it is possible to have large-fruited summer strawberries into August ; and since, finally, as will appear, the large-fruited perpetual strawberries, the 'remontants' begin to ripen their second flush of fruit in July, there would seem to be no particular reason for devoting the late summer season to Alpine varieties. There are, however, two good reasons for devoting part of July and August to the Alpine varieties, at least in this book. In the first place they usually are in full ripe fruit in the possible gap between the summer strawberries and the perpetuals, which we deal with in the next chapter. In the second place the best time of year for sales of Alpine strawberries is the tourist season, when some London restaurants will buy this fruit.

Of the origin of these varieties I have written in Chapter II : they were, as we have seen, rather more likely to have been mountain strains of *F. vesca* than a separate species, although they were, and sometimes still are, given specific status. If, as I believe, they were *F. vesca*, it seems that in order to accommodate themselves to high altitudes, with a climate differing from that at sea-level in the same latitudes, they spread their fruiting season over a longer and longer period, until it extended throughout the entire summer and autumn.

The introduction of one of these varieties to England occurred in 1760 when seed was sent from Turin and planted in the royal

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gardens. Subsequently plants from Mont Cenis were introduced from France.

From the flavour and perfume of the fruits and the morphology of the plants I doubt whether modern Alpines are all of pure *F. vesca* descent. There seems to be traces of *F. viridis* in the fruit colour of some varieties, and of *F. moschata* or *Hautbois* in the flavour. The history of the Alpines is scant and obscure; if *F. moschata* could have been crossed with *F. vesca* then, in theory, it could not have been crossed with large-fruited octoploid varieties: but Monsieur Charles Simmen has, in fact, carried out this cross.¹

At all events, the Alpine varieties can be divided into two major classes: those which grow runners and those which do not. As it happens, the runnerless varieties, descendants of *Gaillon* (and presumably *Gaillon* was a selected *F. eflagellis*, actually a ssp. of *F. vesca* arising as a sport), are larger and more vigorous plants, with fruit of larger size and superior quality. As Alpines are, in any case, propagated from seed, we propose to ignore the runnered varieties excepting in the matter of giving a short list of their names, for the sake of completeness.

The runnerless varieties of Alpine strawberries make large and handsome plants, the leaves of which, light green, light in structure, pointed, and with numerous teeth or serrations, differ markedly from those of ordinary strawberries. It is impossible for the experienced gardener to mistake one for the other. The Alpine plants are often enormous, but they are bushy, more erect in habit, yet somehow lighter and wilder in air. The fruit is carried in trusses, with very few singles, on tall, stout stalks often high above the foliage. The fruit is often quite large—I have had them bigger than a penny, but usually about the size of a sixpence or smaller. It varies a great deal in shape, even on a single plant, from blunt-conical to something like long-elliptical—a fruit three times as long as its greatest diameter at its equator. When first picked the fruit is light and dry, and a single fruit or even several in the mouth at one time, unless they are rotten-ripe, seem nearly tasteless and leave an after taste of slight bitterness.

¹ See Chapter VIII.

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ness. When perfectly ripe the flavour is high. The perfume is at all times greatly superior to that of the best large-fruited varieties. If a handful or two of these small strawberries be placed in a bowl, slightly crushed, sprinkled with sugar, dressed with a tablespoonful of Sauternes or Barsac, and left covered to stand for several hours, then the full flavour of the Alpine strawberries is experienced, and that appetite aroused by the perfume is no longer disappointed in the eating. The white fruits are superior in flavour to the red, but inferior in perfume. As a sensory experience, the taste of Alpine strawberries should not be compared with that of the big strawberries ; they are two different aesthetic sensations, and should be considered as such.

There are two principal ways of growing Alpine strawberries. As edging plants in the kitchen garden they make a good, neat finish to the borders, provided that weeding is attended to, that water is plentiful, and that the plants are not trampled on. Otherwise they can be planted in rows in borders, like any other strawberries. I prefer this method, since hoeing, watering and manuring can then be properly attended to ; and the crop is worth much trouble.

Very gross feeders, Alpine strawberries should be planted in richly manured soil (see Chapter III). In southern England they will do quite well in partial shade, and may be planted beneath fruit trees or interplanted with fruit shrubs. The only condition which they will not tolerate is drought ; some shade is therefore actually desirable, for it conserves moisture. But not full or deep shade, of course. Planting distances should be as for any other variety making a large plant—say 18 inches between plants and 30 inches between rows.

In east Kent Alpine strawberries begin to flower in early May, or even in April, carry small crops of fruit in June, and a six-weeks' flush of main crop in July and into August. Thereafter they bear continuously but not very heavily well into October. The fruit is often so small and light that a considerable number of plants, certainly not fewer than fifty, is required in order to assure a sufficient quantity at each picking.

Alpine strawberries respond quickly and reliably to treatment

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designed to obtain the largest fruit they are capable of bearing, either for the gardener who likes the larger fruit for showing or who finds the average size too small for dessert. To obtain the largest fruit, the plants should be kept hoed, the tilth being very shallow, however, and watered with a weak infusion of cow dung once a week in June/July; or, if the weather is very wet, dried soluble blood can be hoed in in small quantities at frequent intervals from April onwards. The effect of this food is not seen for at least two months. About ten days before a picking of particularly fine fruits is required, go over the beds and pick all but the best two flowers on every truss—all but one if very large fruit is required. If the fruit is wanted for showing, it is well to prop each stalk with a piece of stiff wire looped at the top to rest the stalk and stuck into the soil. This will hold the forming fruit up to the sun. With the variety *Baron Solemacher* it is not difficult, by this means, to get every fruit as large as a shilling and some twice that size, very pretty berries, either blunt-conical in shape, or long and thin, and in colour a bright crimson. The white fruits, so called, are in fact yellow, flushed faintly with rose, smaller than the red but better flavoured, as I have written already.

It would be much too sweeping to claim that there is no commercial market for Alpine strawberries to-day in Britain. It will be found more or less impossible to sell this fruit in provincial towns. But the fruit is a delicacy and is served at vast cost in the best Parisian restaurants; in London, before the war, head-waiters used to enjoy offering this fruit as a sweet to young men trying to impress a girl, justifying its price and, at the same time, garnishing the dish with glamour by stating that it was flown over from the Bois, that morning, by *Air France*. Whether, in fact, any such traffic ever existed is questionable. What is certain is that a few growers here and there, who have either made arrangements directly with the better restaurants in Soho, Bloomsbury and Mayfair, or have the services of one of the more enterprising Covent Garden concerns, have a very nice little trade in Alpine strawberries, which will pass for *fraises des bois*; supplies are maintained right through the summer and into the autumn, and

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the average price throughout is of the order of 5s. a pound received by the grower. This sounds a great deal, but picking a pound of Alpines is laborious. They should be packed in half-pound punnets, of wood or cardboard, and sent to market covered with a skin of cellophane secured with an elastic band. To make this trade worth while it is necessary to have quite a quarter of an acre of plants, or the grower will not be able to send enough to market at one time to justify transport costs : the half-pound packs are usually sent away in flat trays holding a dozen or more. For this purpose, Italian peach boxes are excellent, the Italian name being obscured by the English grower's own label. There is much satisfaction to be had out of thus making use of one of the principal assets of one's foreign competitors.

Alpine strawberries make a jam of very high flavour, with an undertaste of bitterness which makes it suitable for breakfast. The preserve is very stiff, the berries presumably having far more pectin than the big strawberries.

For the propagation of Alpine strawberries, see Chapter X.

Neither of the systems of management recommended for large-fruited strawberries is suitable in the case of Alpines. The plants of these varieties may be treated as annuals, or may be allowed to bear for two years, but most of them are not very good in subsequent years, often showing signs of degeneracy, perhaps due to virus disease. On the whole it is best to treat the Alpines as annuals, for the first-year fruit is much the best in size and quality. The seedlings (see Chapter X) should be ready to plant out by June or July and they can be brought on so well that they will flower that autumn. In that case, remove the flowers. Deblossoming can be avoided by later planting. A new lot of seed having been sown in the following spring, in the autumn the old plants can be destroyed, by which time the new seedlings will have been planted for the next year's crop.

If the plants are kept for a second year they will bear a larger crop of smaller fruit. In this case seed will be planted every second year.

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Varieties

Varieties of Alpine strawberries are excessively numerous and there would be no point at all in giving a long list of them. A short list of the best varieties will be more useful.

Runnerless Varieties

Reine des Vallées. Both red and white fruit of excellent flavour and fragrance. Medium size (for an Alpine that is : small = a very large pea ; medium = a shilling ; large = a florin). I think that this is about the best of the Alpines. The plants are pretty and grow very large in their second year. A third year's good fruiting and even a fourth can be had, where there are no virus symptoms, by crown-division, without bothering with fresh seed.

Baron Solemacher. This has the air of being a selected strain of *Reine des Vallées*, if that means anything where propagation is by seed. The plants are very large indeed, but have a slender, graceful air. The fruit resembles *Reine des Vallées*. A few single fruits, or many if special de-blossoming and feeding are resorted to, are as large as ordinary strawberries. The red ones are the most handsome strawberries I know with the exception of the fruit of *St. Claude*. White-fruited plants are rarer than red and come more or less true from seed.

La Victoire Française (not to be confused with *Victoire*). Large fruit, large crop, long season, early, flavour fair to good. Red.

Schöner Wienerin. Red, flavour excellent, but the fruit is very small.

Monstrueuse des Bois. Vigorous and hardy, large fruit, slightly musky, like *Hautbois*, but sweet as wild strawberries.

Monstrueuse Caënnaise. This has so much larger fruit than other Alpines that were it not for the morphology of the leaf one would suspect it of being a 'remontant'. It is of good quality.

Varieties with Runners

Note : if these are grown it is possible to let them increase into a solid mat, to form a wide border. The mat will exclude weeds when it is formed. It must be rogued for sick individuals,

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however, and the oldest plants systematically removed each season.

La Brillante. Resembles *Reine des Vallées* but, on the whole, inferior.

Belle de Meaux. Long season, small, long-shaped fruit, of good quality.

Ruhn von Dobelitz. Small, red and good.

Schöne Meisnerin. Red and yellow fruit. Quality fair, size small to medium.

Note on the words *Quatre Saisons*. *Quatre Saisons* is the French phrase which means what we mean by 'Alpine', in strawberries. But the expression is much abused in current usage, and in some parts of France, e.g. in the Alpes Maritimes, the ordinary strawberry of commerce commonly grown is called *Quatre Saisons* although it is one of the intermediate class between ordinary summer strawberries and 'remontant' varieties, which have two crops a year, one in summer and one in autumn. Thus, when a French grower talks of *Quatre Saisons* varieties, he may mean Alpines, but he may not. In addition to the Alpines named, the following are widely cultivated on the Continent: *Perle von Wienerwald*; *Gaillon Amélioré*; *Eryth Kind*.

VIII

THE LATE STRAWBERRY SEASON (August to November)

For the purpose of our system of strawberry seasons, the late season begins in August and continues into November. I have picked fairly ripe strawberries from under unheated cloches as late as December 7th, but they were not of very good quality: in ripening early winter strawberries, a subject which I shall come to later (Chapter IX), the absence of heat seems to be less important than the want of light—although both are necessary.

The late season beds will be planted only with varieties of perpetual large-fruited strawberries, that is what the Americans call 'everbearers', the Germans *immertragende Erdbeeren* and the French *fraisiers à gros fruits remontants*. We have no word for this in English as no one has bothered to breed any of these varieties although they are the most interesting of all strawberries. As the word *remontant*, which refers to the habit of constantly sending up fresh flower trusses for months on end, can be used as adjective and verb as well as a substantive, I shall adopt and use it hereafter.

Plants of most varieties of the remontant strawberries are comparable with or larger than those of ordinary strawberries, but have much the same appearance, that is they differ sharply from the Alpine varieties. The fruit is also the same size as or larger than that of the ordinary strawberries, but very diverse in shape, according to the variety. Similarly, like the ordinary strawberries, nearly all the modern remontants make runners, and can be propagated by runner plants. In some cases the

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number of runners is extremely great—for example the American variety *Red Rich* is very copious in this respect. A certain number, probably not more than three or four varieties, make few or no runners and have to be propagated by crown or root division. But as to those, the great majority, which *do* make runners, these cannot be treated exactly as if they were ordinary strawberries: the habit of remontant fruiting means that the runner plants throw up flower trusses and set fruit almost as soon as they are formed, and before they are rooted.

I will run through a typical year in the life of a remontant variety.

The runner plants, extremely small, for they are chosen deliberately with a view to their immaturity, so that their remontant potential is high, are planted out late in autumn, probably not until mid-October, and given the same care as any other young strawberry plants. The planting distances will exceed those suitable for ordinary strawberries, however, as remontants grow enormous. This is in the case when planting in rows: there is another method which will be dealt with in its place.

The remontant plants will begin to grow very fast in March and will flower in late April or early May, depending on the seasonal weather and the site. Those first flowers must be picked off assiduously, and the de-blossoming continued until about May 20th. The object of this is to direct the energy of the plants into the roots and foliage and crown-formation, for the enormous strain of four-months' bearing which is to follow. In June there will be a short interregnum, followed by renewed flowering late in the month and in July. Some ripe fruit will be picked in July, more in August, during which month and in September the flowering becomes profuse beyond belief, some plants of some varieties carrying as many as sixty trusses at one time. The heaviest crop will be in September, but given good weather it will continue profuse through October, and the plants will still be covered with flowers and fruit in all stages of growth when cut down by frost in November. Early in October, or in September, the plants will be cloched, which may present special problems, owing to their size. The most prolific varieties will

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bear, in their four-months' season, as much as two pounds of fruit, or even more.

The dates in the above progress vary from variety to variety; some begin and finish earlier, others later, and it is difficult to give this variation as a set of rules, for it depends a good deal on site and microclimate. Some varieties are what the French call *hâtif*, by which they mean not only *early*, but early by reason of the rapidity with which fruit is formed and ripened. Another difference which distinguishes varieties is this: only some of them have the absolutely continuous remontant habit, others have, rather, several short cropping periods, separated by several interregna when they do not flower. Yet others are so different that they must be treated differently: these last are plants which bear an ordinary early summer crop, then rest, and bear an autumn crop in September/October. In the case of these varieties the April/May flowers must not be picked, but allowed to set, unless it is desired to put all the strength of the plants into the autumn crop—a wise commercial policy since strawberries fetch twice the price in September.

Remontant varieties bear such enormous crops in a single season—with some varieties ten tons to the acre is not uncommon and twenty tons not unknown—that they are said to exhaust themselves very rapidly. A second-year crop is possible, in fact common, from a plantation, but never a third, and the rule in France is to treat these varieties as annuals, replanting with runner plants every year. This is costly, but is rewarded by the quality of the crop. Replanting every second year is a better plan commercially. It is, after all, no more than *Royal Sovereign* growers are forced to do by reason of the debility of that variety.

SOIL, SITE AND MANURING

The choice and preparation of soil for remontants is much the same as for ordinary strawberries, but there are differences. The remontants are the grossest feeders of all strawberry varieties, and it is wise to increase the quantities of all manures by one-third when dealing with one of the remontants. Still more important

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—only one or two remontant varieties will stand drought, and then only partially. If these varieties are to be grown on any scale, provision for copious watering during dry spells is *essential* or total failure is certain. These varieties prefer a strong, holding soil rich in humus. They should also be mulched.

The site should have a southern exposure, and where possible some protection from the inclement quarters, since fruiting will continue into the autumn. Spring frosts are no problem, because we are not concerned with an early crop; but October frosts will cut off the plants in full bearing. In getting fruit to ripen so late in the year, light is of the first importance, and therefore there must be no shade, but day-long sunshine exposure. Finally, the site should be well drained.

The runner plants are set out in October, the grower choosing the *latest and smallest plants which have not yet flowered*. It is desirable that they should hardly grow at all that year, but should start as youthful as possible in the spring: apparently the remontant propensity is connected with the *age* of the plant. The crop potential of a plant is thus greater if it begins the season very young with none of its flower-forming capacity used up, as it were.

PLANTING DISTANCES

These vary with varieties, but broadly speaking there should be three feet between rows and eighteen inches between plants. Plants of *St. Claude*, *La Sans Rivale* and *Record* may easily cover four or even more square feet when fully grown. These distances relate to ordinary row cultivation.

BLOCK OR MAT CULTIVATION

A different method of cultivation is suggested by the remontant habit of fruiting on their runners. If the plants are cultivated in rows, then it is best to de-runner them regularly, and force more flower trusses from the parent plant; if it is desired to avoid this, then the block system should be tried. Its disadvan-

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tages are that it entails the growth of a mat of plants, which cannot be weeded, although annual weeds will not get a chance to grow, and that the mat of foliage produces conditions in which botrytis is liable to flourish. The crop from this system is probably rather heavier for an equal number of parent plants, but the berries will be smaller.

Each plant is given a square yard to itself, so that at first the block consists of a border a yard wide, and as many yards long as there are plants. The plant is set in the middle of the yard of soil. As soon as it starts to make runners these are simply allowed to root themselves, the only care being that of keeping them within the predetermined limits of the border or block. In time, and not very much time, the whole yard-wide area becomes full of plants all flowering and fruiting. When the season is over, say in October (for plants so grown cannot be cloched), the original parent plant and the earliest and largest runner plants are severed and removed, and the rest left. The system is thus permanent, and can usually be maintained for many years where the variety is resistant to virus. Eight years is considered the limit. Each November, the oldest plants are removed, so that there is constant renewal.

When planting, unless the soil is wet, the plants should be watered in and subsequently kept hoed to a very shallow tilth, and firmed after frost and thaw. In the early spring they should be watered with a weak infusion of dung or with a weak solution of blood.

With variation from variety to variety, flowering begins in late April and these flowers are all removed as described above up till about May 20th. Early summer fruit is not wanted from these varieties, and one French grower has asserted, what Major Corner confirms at the Coronet Perpetual Strawberry Plantations, that for every flower left to set before May 20th, ten strawberries are lost in the autumn.

Flowering begins again in June, in the case of the fully remontant varieties, but not until August or even September in the case of the two-crop varieties. In any case the grower of remontants has ripe fruit from July until into October, and to



Variety *Charles Simmen* from the author's garden. The core is soft. Actual size: a singleton

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and destroying dwarfed, warped or otherwise flawed plants, which should be very few, if any at all, excepting where *Royal Sovereign* is the variety, in which case diseased plants may be numerous.

Carry out the manuring programme suggested in Chapter II. Give a shallow hoeing each side of the rows and between the plants, leaving the soil rough, and dig down the centre of the alleys, leaving the soil in lumps, not in a fine tilth.

In March the plants will begin to grow again. They will be well forward in new leaf by April. The soil can be hoed down to a rough tilth. Late in April and in May, flowering begins and continues, and also the production of runners. Remove these runners regularly and rigorously. In heavy and in medium soils weeding should be thorough; in very light soils, in which strawberries will not grow unless the organic manuring has been very heavy, some weeds are actually a help to the plants.

In May flowering begins, and also the growth of runners. Be rigorous and regular in removing these. When going over the beds for this purpose, inspect the plants for pests and for symptoms of virus disease and remove and destroy diseased plants, replacing them from the nursery if any young plants remain there. These transplanted replacements should have the flower bracts removed, and are for fruiting in the following season.

FROST

In the early season, frost was not considered of great importance, as the flowering plants were protected by cloches. In the case of unprotected plants there is always a danger of total loss of crop, a frost of five or six degrees Fahrenheit being enough to kill the vital organs of the flower if these are subsequently exposed to the sun, which they must be. The damage will not, in fact, appear until some time after the morning sun has been shining on the plants, when their centres will be seen to be blackened.

There is considerable difference in the susceptibility of varieties to frost damage and some varieties are actually listed by the

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French as immune. The difference is probably not so much due to any special hardiness or want of it, but rather to the different growing habits of varieties. Those with leaves which tend to grow outwards, or to fall low by reason of weak stems, offer their flowers no cover, so that damage in the case of frost in May will be severe. Varieties with sturdy stems and an erect habit, and with short flower bracts often cover the flowers with the leaf, and many flowers escape damage.

The period during which the strawberry grower undergoes nightly agony of mind is from the beginning of May until about May 20th, after which he is usually safe. The commercial grower, unless he can apply the principles of frost protection set forth in East Malling's Pamphlet No. E.352, can do nothing to protect his plantation, by reason of its size. Therefore no strawberry plantation should be low, or in a hot-spot; and where possible planting should be above the frost level. But the amateur grower, forewarned by the B.B.C., by the local wiseacres and by his own *nous* can take steps.

It is a remarkable fact that almost any obstacle, however trifling, interposed between the plants and the open, clear sky into which precious calories from soil, plant and lower atmosphere are being radiated, will check the loss of heat to which ground frost is due. A sheet of newspaper—*The Times*, oddly enough, being warmer than either the *Daily Worker* or the *Daily Mirror*—is effective as protection.

The gardener will have provided himself with fishnet for use against birds when his fruit begins to ripen. By the driving in of a system of short, stout stakes, and stretching between them a grid of taut wires, he will also have some support on to which the nets can be spread and clipped with bulldog paper clips. If this anti-avian device is put in place as soon as the plants begin to flower then, when frost threatens, newspaper weighted with a few stones can be spread on the net and the flowers will be safe against all but the very rare severe frost. In fact, the net alone will, improbable as it may seem, afford some protection, a nice demonstration of the validity of claims made by cellular under-wear manufacturers. It happens that May frost nights are by

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definition windless, so that they are about the only nights in the year when newspaper *can* be spread out in this way. It must, of course, be removed in the morning. This method not only protects the strawberry flowers, but provides a justification for spending three-ha'pence on a newspaper, a long felt want.

The maiden plants of a first-year plantation will produce many single flowers, giving rise to prime fruits, and a few trusses of several flowers, giving rise to secondary fruit, equally good, but smaller. The crop will be only moderate in weight.

STRAW

It is generally assumed that strawberry beds must be strewn. Strewwing should be avoided when it is possible, but this is rarely. Straw keeps the fruit clean and tolerably dry, and it is therefore necessary even through it carries weed seeds, harbours slugs and mice, may cause a local nitrogen famine, is troublesome to put down and untidy when in place; if put down before the fruit is set, it increases the danger of frost damage. The amateur grower can avoid using straw—for example by covering the soil with bits of broken glass pushed under the plants, thereby warming up the soil also. However, as a rule strewwing is unavoidable on all but light sands, which grow poor strawberries anyway. Short, barley straw should be used, tucked well in under the plants and trodden flat. Too much is worse than not enough. The straw is laid parallel with the rows, of course, the worker putting it down and backing away from it as he, or usually she, tucks it in.

The commercial grower will pack his fruit in one- and two-pound chips or punnets, the fruit being graded for size—the selected put into the one-pound and the truss fruit into two-pound packs. Packing in 'squares' is probably not worth while even with the best fruit, at the height of the season.

After harvest the straw is removed to the compost heap, also the runners and dead leaves; the soil is cultivated, unhealthy plants removed and replaced; in fact all should continue as before the crop, although, as a rule, from August to December strawberry plantations are to be seen lost in a jungle of weeds. With the onset of winter and manuring time, the alleys can be

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dug down the middle, but not near the plants. This digging should be left rough and, as we say in east Kent, even clytey, so that frost and rain can penetrate, giving that invaluable natural cultivation which is a great ally of the good gardener.

Some commercial growers practise burning off the strawberry fields the moment cropping is over. The straw is raked away from immediate contact with the plants, into the alleys. Then, in dry weather and with the wind down the alleys, a match is set to the straw in each valley. The fire travels swiftly down the alleys, and straw, weeds and the old foliage of the plants, including any insect pests about, are all burnt off. The alleys are then cultivated.

In theory, and usually in practice, no damage is done to the crowns of the plants which soon break into fresh young foliage, and thus benefit from the burning off, while cultivation, whether with tines or a rotary cultivator, is facilitated.

But there is much to be said against this practice and I have heard one of the principal Kentish growers say it with great emphasis, while another was defending burning off with equal warmth. It is wicked to burn straw, the raw material of humus; it ought to be turned in, not burnt. But in that case the plants do not receive the benefit which comes from the destruction of their old foliage, runners, etc., and results in fresh foliage. To cover this point there is an American practice increasingly used in parts of Britain. As soon as cropping is over, the whole top of the plant is cut off, with a brushing hook or sickle. The material removed is raked into the alleys and turned in with the straw, and in due course the shorn plants break into fresh growth.

This is a practice which can be recommended, and it is certainly preferable to burning off. I have even heard of sheep being turned into strawberry fields to graze off the old foliage, but I have no knowledge of such a practice.

In the following season and again in the third year, the care of the beds will be the same as in the first year. In the second season the crop will be heavier but there will be more truss fruit than singles, the berries will be smaller and less regular in shape. In the third season this tendency to degeneration is more marked

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and after the third crop all plants which are three years old, that is all but transplanted replacements, should be uprooted and destroyed, the bed dug, heavily manured with compost, dried blood and bone, or according to the principles set forth in Chapter II, and the bed replanted from the nursery stock. A still better practice, if it can be managed, is to dig up and destroy all the plants in the old bed, devote that space to some other crop, and remake the strawberry plantation elsewhere. A crop of potatoes can be grown in the old place, followed by one of peas, and it can then be replanted to strawberries after a new manuring. But if it, the old space, is to be used as a strawberry bed again, after a couple of years, then no such gross feeders as brassicas should be raised in it, only potatoes, turnips and legumes, or flowers.

The replanting, whether on the new or the old site, should be carried out in July/August, so that the new bed can be cropped in the following summer, and no year lost.

METHOD Two

This method is suitable for commercial plantations, for large gardens with extensive strawberry beds, or wherever it is impossible to maintain a strawberry nursery, and where plants must be bought in. As it is difficult and expensive to do this early enough for cropping the following summer, this method is designed to procure a crop every year despite the necessity for autumn planting of young stock.

Divide the area to be planted with a particular variety and for a particular season, into three plots, which we will call A, B and C. Taking the year 1953 as a point of departure, plant up plot A in September or October, but not later, of 1953. Carry out the routine of care as described in Method 1. But in the spring, when the plants flower, pick off all the flower bracts and allow no fruit to form. Continue with care and cultivation as before.

In September/October 1954, plant up plot B, with the same variety and treat it in the same way.

Plot A will bear its first crop in the summer of 1955 and it should be good in all respects, since the plants should now be

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very large and, if healthy, capable of bearing more heavily than plants cropped in their first year. After harvest, treat the plot as in Method 1. In the same summer, 1955, plot B will be de-blossomed, but it will carry its first crop in 1956, while A is carrying its second crop. Meanwhile in the autumn of 1955, plot C has been planted up, and in the following summer is being de-blossomed; and in the following season while plot C carries its first and best crop, plot A carries its third and last. Plot A is then cleared and replanted with new stock, or it is remade on a new site, which is preferable. Here, set forth in a table, is the whole system.

<i>Year</i>	<i>Plot or Field A</i>	<i>B</i>	<i>C</i>
1953	September Plant up		
1954	April/May Remove flowers	September Plant up	
1955	June/July Crop	April/May Remove flowers	September Plant up
1956	June/July Crop	June/July Crop	April/May Remove flowers
1957	June/July Crop September Replant	June/July Crop	June/July Crop
1958	April/May Remove flowers	June/July Crop September Replant	June/July Crop
1959	June/July Crop	April/May Remove flowers	June/July Crop September Replant
1960	June/July Crop	June/July Crop	April/May Remove flowers

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Gardeners who buy strawberry plants instead of raising them in their own nursery should deal with a firm of repute and should get plants carrying the Ministry of Agriculture's certificate of health. The value of this certificate can be and often is questioned; but it certainly possesses some value, for it means at least that the young plants come from a carefully inspected, sprayed and rogued plantation, and if, nevertheless, they turn out to have among them infected individuals, these will be fewer than in the case of uncertified plants.

So much for the management of the plantation. We come next to the question of varieties and aspects, by the choice of which the strawberry plants to be cultivated in the manner described fall into three ripening seasons, to wit:

- (i) June 15th to 30th approximately.
- (ii) June 30th to July 25th approximately.
- (iii) July 20th to August 10th approximately.

(i) THE FIRST PERIOD OR SEASON

Aspect

To emphasize the earliness of this 'period', the varieties in question should be planted with a full southern exposure, and preferably in ground sloping gently downhill from north to south, or from north-west to south-east. The wet western winds which prevail all over the British Isles are disliked by all fruit plants, and a south-eastern exposure, even though it may be colder than a south-western one, is usually preferable.

Varieties

These will be the same as those planted under cloches, for the early season, and it will therefore be enough to recall their names without repeating their descriptions:

Cambridge 173
Cambridge 410
Reine des Précoce
Hâtif de Caen

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In addition to these four, three others of interest may be tried, first in the open and in a subsequent season under cloches. They are not included in the short list because although in some respects superior to the chosen varieties, they have been found to be much fussier about soil and microclimate, and do not seem to flourish everywhere indiscriminately.

Aurora Hâtif. This is an average-sized plant, remarkable for its healthy foliage. The crop is moderately large and the berries medium to large, regular and a good colour. Flavour excellent. The great advantage of this variety is the rapidity with which the fruit forms, grows and ripens.

Hercule. Very fine flavour, very large fruit, in copious quantity, very early, on enormous plants. Almost as susceptible to virus as *Royal Sovereign*. Often produces an autumn crop.

Précoce Musqué. An extremely early variety with good growing habits and medium to large fruit of the delicious, musky, *Hautbois* flavour. Monsieur Simmen, who raised this variety, says that it is in fact a cross between a 'large-fruited' and an *Hautbois* variety. Geneticists might declare this impossible, but the strawberries taste as if it's true.

THE SECOND PERIOD (June 30th to July 25th)

Aspect

To emphasize the lateness of the varieties to be planted, relative to the above group, the following can be planted with an eastern, or even south-western exposure, excepting in the West Country, where heavy rainfall may bring with it fungus trouble if the plants are too open to the south-west winds.

Varieties¹

Royal Sovereign (an East Malling clone, say 40 or 48). When healthy the plants are very large, tall and of a brilliant green.

¹ The pernicious system of Central Markets in Britain puts a premium on certain varieties and the commercial grower is more or less forced to conform. At the moment the fashionable varieties are *Sovereign*, *Perle de Prague* (Lord knows why!) and *Climax*.

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The crop is medium to large, the berries very large and shapely on maiden plants, medium to small on older plants, and less shapely. Accommodates itself to a wide variety of soil and resists both drought and wet. The flavour of the fruit, without being among the best, is excellent, although Lesourd, in *Le Fraisier*, only concedes it a *good* and regards the variety as a commercial, not an amateur's, strawberry. But the variety has disadvantages, the worst of which is its extreme susceptibility to debilitation by five kinds of viruses, a complex which produces yellow edge, mild crinkle, severe crinkle, dwarfing, and what have you. The variety cannot be grown at all where other varieties are cultivated because of this weakness, and even certificated plants grown in isolation are liable to collapse. On the whole, we have decided that this variety is more of a nuisance than it is worth, and abandoned it.

Cambridge Seedlings. Of the numerous Cambridge seedlings few are good and all seem sensitive to virus, but some are of high quality, the best being the pine-flavoured varieties. Commercially, Number 422 is good. For the amateur who wants well-flavoured fruit, Nos. 632 and 641 are better, in the *Royal Sovereign* class, and claimed by some to be better. The work of breeding new varieties has passed to the John Innes Institute, and we can expect some super-Cambridge varieties in due course.

Sir Joseph Paxton. This variety is for heavy soils, but it is difficult to find a good strain. It is vigorous, with dark foliage and crimson fruit of good flavour.

Docteur Morère. Big plants with a fine healthy air. It will not grow if there is a suggestion of chalk, being very susceptible to chlorosis. Single fruit is very large, heart-shaped or fan-shaped, of good colour. Flavour and perfume—superb.

Madame Moutot. Included here on the probably inadequate grounds of being the largest strawberry known to science. As a cross between *Royal Sovereign* and *Dr. Morère* the flavour ought to be good, whereas it is poor, but the fruits are far larger than those of either parent, lumpish in shape, and of fair colour.

There are very numerous other varieties, but there is no point

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in listing them all. Certain varieties superior to those in the list in all but the weight of crop can be substituted by the gardener who wants quality above all, e.g. *Sulpice Barbe*. Other varieties have been left out because, like the superfine *Vicomtesse Héricart de Thury*, it is almost impossible to find a healthy strain ; or, like *Ville de Caen*, virus debility makes them impractical. One which might have been added to this middle list is *Muscade*, equivalent to *Précoce Musqué* in the earlier list. 'Muscat' strawberries may become as well-considered as Muscat grapes, in the future, and *Muscade* is one of these.

THIRD PERIOD (July 20th to August)

Aspect

The gardener's object with the following varieties is to keep the crop back and get it as late as possible. The aspect should therefore be *northerly*. The idea that fruit will never ripen with a northerly exposure is erroneous. It will ripen late. I get superb *Golden Gages* (Oulins) of exceptional size and flavour off a north wall which never gets a glimmer of direct sunshine. They are, of course, late, which is an advantage. At East Malling Research Station, one of the buildings is planted to pears on all four walls, and the fruit of all these splendid giant cordon trees ripens. Strawberries will ripen late if exposed north, but they should not be planted under tree shade, which is not the same thing at all.

Varieties

Bedford Champion. See epicure's list. Do not expect large crops.

Auchincruive Climax. Medium-sized plants, with a fair crop of medium-sized but very shapely and regular fruits of a fine scarlet colour, which helps them in the markets. The flavour is fairly good—not up to *Sovereign*—and greatly inferior to the best. The variety has a good name as to virus and resists Red Core, but it seems that it suffers from some genetical instability touching the chlorophyll control, so that it is liable to turn completely yellow and die. The trouble is not so common as to make the variety

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useless, of course, and for commercial plantations *Climax* would be preferable to *Royal Sovereign* if only the flavour were better. The variety produces crops in flushes all through the season, if properly encouraged, and nearly always a large autumn crop.

Eleanor. If you can find it—large, rosy pink fruit, conical and of excellent, acid flavour. Exposed to the north and in clay soil will not ripen until July and continues well into August.

Etter. Not tried by me, this Australian strawberry is said by my French informants to be very late and very good, resistant to all diseases.

Tardive de Léopold. Vigorous, large plants, large berries in great number, brilliant red and of excellent flavour. Very late. The variety is not self fertile, having only pistillate flowers, and must be planted in association with another late variety, although as its lateness is rather a matter of slow fruit maturing than late flowering, *Royal Sovereign* will fertilize it. Another pollinator, also very late, is *Jucunda*, an old English variety, very late, remarkably sugary but rather insipid.

Other late varieties, if you can get them, are the very deep purple *Black Prince*, and the rather similar *Waterloo*. Laxton's *The Latest*¹ is probably later than *Tardive de Léopold*, and equally late, by all accounts, was *Myatt's Prolific*¹ also known as *Wonderful*.

¹ Both out of cultivation today, however.

VII

THE LATE SUMMER SEASON

ALPINE STRAWBERRIES

Since many varieties of Alpine strawberries produce ripe fruit from June to September; since, also, as we have seen, it is possible to have large-fruited summer strawberries into August; and since, finally, as will appear, the large-fruited perpetual strawberries, the 'remontants' begin to ripen their second flush of fruit in July, there would seem to be no particular reason for devoting the late summer season to Alpine varieties. There are, however, two good reasons for devoting part of July and August to the Alpine varieties, at least in this book. In the first place they usually are in full ripe fruit in the possible gap between the summer strawberries and the perpetuals, which we deal with in the next chapter. In the second place the best time of year for sales of Alpine strawberries is the tourist season, when some London restaurants will buy this fruit.

Of the origin of these varieties I have written in Chapter II: they were, as we have seen, rather more likely to have been mountain strains of *F. vesca* than a separate species, although they were, and sometimes still are, given specific status. If, as I believe, they were *F. vesca*, it seems that in order to accommodate themselves to high altitudes, with a climate differing from that at sea-level in the same latitudes, they spread their fruiting season over a longer and longer period, until it extended throughout the entire summer and autumn.

The introduction of one of these varieties to England occurred in 1760 when seed was sent from Turin and planted in the royal

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gardens. Subsequently plants from Mont Cenis were introduced from France.

From the flavour and perfume of the fruits and the morphology of the plants I doubt whether modern Alpines are all of pure *F. vesca* descent. There seems to be traces of *F. viridis* in the fruit colour of some varieties, and of *F. moschata* or *Hautbois* in the flavour. The history of the Alpines is scant and obscure; if *F. moschata* could have been crossed with *F. vesca* then, in theory, it could *not* have been crossed with large-fruited octoploid varieties: but Monsieur Charles Simmen has, in fact, carried out this cross.¹

At all events, the Alpine varieties can be divided into two major classes: those which grow runners and those which do not. As it happens, the runnerless varieties, descendants of *Gaillon* (and presumably *Gaillon* was a selected *F. eflagellis*, actually a ssp. of *F. vesca* arising as a sport), are larger and more vigorous plants, with fruit of larger size and superior quality. As Alpines are, in any case, propagated from seed, we propose to ignore the runnery varieties excepting in the matter of giving a short list of their names, for the sake of completeness.

The runnerless varieties of Alpine strawberries make large and handsome plants, the leaves of which, light green, light in structure, pointed, and with numerous teeth or serrations, differ markedly from those of ordinary strawberries. It is impossible for the experienced gardener to mistake one for the other. The Alpine plants are often enormous, but they are bushy, more erect in habit, yet somehow lighter and wilder in air. The fruit is carried in trusses, with very few singles, on tall, stout stalks often high above the foliage. The fruit is often quite large—I have had them bigger than a penny, but usually about the size of a sixpence or smaller. It varies a great deal in shape, even on a single plant, from blunt-conical to something like long-elliptical—a fruit three times as long as its greatest diameter at its equator. When first picked the fruit is light and dry, and a single fruit or even several in the mouth at one time, unless they are rotten-ripe, seem nearly tasteless and leave an after taste of slight bitterness.

¹ See Chapter VIII.

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ness. When perfectly ripe the flavour is high. The perfume is at all times greatly superior to that of the best large-fruited varieties. If a handful or two of these small strawberries be placed in a bowl, slightly crushed, sprinkled with sugar, dressed with a tablespoonful of Sauternes or Barsac, and left covered to stand for several hours, then the full flavour of the Alpine strawberries is experienced, and that appetite aroused by the perfume is no longer disappointed in the eating. The white fruits are superior in flavour to the red, but inferior in perfume. As a sensory experience, the taste of Alpine strawberries should not be compared with that of the big strawberries ; they are two different aesthetic sensations, and should be considered as such.

There are two principal ways of growing Alpine strawberries. As edging plants in the kitchen garden they make a good, neat finish to the borders, provided that weeding is attended to, that water is plentiful, and that the plants are not trampled on. Otherwise they can be planted in rows in borders, like any other strawberries. I prefer this method, since hoeing, watering and manuring can then be properly attended to ; and the crop is worth much trouble.

Very gross feeders, Alpine strawberries should be planted in richly manured soil (see Chapter III). In southern England they will do quite well in partial shade, and may be planted beneath fruit trees or interplanted with fruit shrubs. The only condition which they will not tolerate is drought ; some shade is therefore actually desirable, for it conserves moisture. But not full or deep shade, of course. Planting distances should be as for any other variety making a large plant—say 18 inches between plants and 30 inches between rows.

In east Kent Alpine strawberries begin to flower in early May, or even in April, carry small crops of fruit in June, and a six-weeks' flush of main crop in July and into August. Thereafter they bear continuously but not very heavily well into October. The fruit is often so small and light that a considerable number of plants, certainly not fewer than fifty, is required in order to assure a sufficient quantity at each picking.

Alpine strawberries respond quickly and reliably to treatment

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designed to obtain the largest fruit they are capable of bearing, either for the gardener who likes the larger fruit for showing or who finds the average size too small for dessert. To obtain the largest fruit, the plants should be kept hoed, the tilth being very shallow, however, and watered with a weak infusion of cow dung once a week in June/July; or, if the weather is very wet, dried soluble blood can be hoed in in small quantities at frequent intervals from April onwards. The effect of this food is not seen for at least two months. About ten days before a picking of particularly fine fruits is required, go over the beds and pick all but the best two flowers on every truss—all but one if very large fruit is required. If the fruit is wanted for showing, it is well to prop each stalk with a piece of stiff wire looped at the top to rest the stalk and stuck into the soil. This will hold the forming fruit up to the sun. With the variety *Baron Solemacher* it is not difficult, by this means, to get every fruit as large as a shilling and some twice that size, very pretty berries, either blunt-conical in shape, or long and thin, and in colour a bright crimson. The white fruits, so called, are in fact yellow, flushed faintly with rose, smaller than the red but better flavoured, as I have written already.

It would be much too sweeping to claim that there is no commercial market for Alpine strawberries to-day in Britain. It will be found more or less impossible to sell this fruit in provincial towns. But the fruit is a delicacy and is served at vast cost in the best Parisian restaurants; in London, before the war, head-waiters used to enjoy offering this fruit as a sweet to young men trying to impress a girl, justifying its price and, at the same time, garnishing the dish with glamour by stating that it was flown over from the Bois, that morning, by *Air France*. Whether, in fact, any such traffic ever existed is questionable. What is certain is that a few growers here and there, who have either made arrangements directly with the better restaurants in Soho, Bloomsbury and Mayfair, or have the services of one of the more enterprising Covent Garden concerns, have a very nice little trade in Alpine strawberries, which will pass for *fraises des bois*; supplies are maintained right through the summer and into the autumn, and

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the average price throughout is of the order of 5s. a pound received by the grower. This sounds a great deal, but picking a pound of Alpines is laborious. They should be packed in half-pound punnets, of wood or cardboard, and sent to market covered with a skin of cellophane secured with an elastic band. To make this trade worth while it is necessary to have quite a quarter of an acre of plants, or the grower will not be able to send enough to market at one time to justify transport costs : the half-pound packs are usually sent away in flat trays holding a dozen or more. For this purpose, Italian peach boxes are excellent, the Italian name being obscured by the English grower's own label. There is much satisfaction to be had out of thus making use of one of the principal assets of one's foreign competitors.

Alpine strawberries make a jam of very high flavour, with an undertaste of bitterness which makes it suitable for breakfast. The preserve is very stiff, the berries presumably having far more pectin than the big strawberries.

For the propagation of Alpine strawberries, see Chapter X.

Neither of the systems of management recommended for large-fruited strawberries is suitable in the case of Alpines. The plants of these varieties may be treated as annuals, or may be allowed to bear for two years, but most of them are not very good in subsequent years, often showing signs of degeneracy, perhaps due to virus disease. On the whole it is best to treat the Alpines as annuals, for the first-year fruit is much the best in size and quality. The seedlings (see Chapter X) should be ready to plant out by June or July and they can be brought on so well that they will flower that autumn. In that case, remove the flowers. De-blossoming can be avoided by later planting. A new lot of seed having been sown in the following spring, in the autumn the old plants can be destroyed, by which time the new seedlings will have been planted for the next year's crop.

If the plants are kept for a second year they will bear a larger crop of smaller fruit. In this case seed will be planted every second year.

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Varieties

Varieties of Alpine strawberries are excessively numerous and there would be no point at all in giving a long list of them. A short list of the best varieties will be more useful.

Runnerless Varieties

Reine des Vallées. Both red and white fruit of excellent flavour and fragrance. Medium size (for an Alpine that is : small = a very large pea ; medium = a shilling ; large = a florin). I think that this is about the best of the Alpines. The plants are pretty and grow very large in their second year. A third year's good fruiting and even a fourth can be had, where there are no virus symptoms, by crown-division, without bothering with fresh seed.

Baron Solemacher. This has the air of being a selected strain of *Reine des Vallées*, if that means anything where propagation is by seed. The plants are very large indeed, but have a slender, graceful air. The fruit resembles *Reine des Vallées*. A few single fruits, or many if special de-blossoming and feeding are resorted to, are as large as ordinary strawberries. The red ones are the most handsome strawberries I know with the exception of the fruit of *St. Claude*. White-fruited plants are rarer than red and come more or less true from seed.

La Victoire Française (not to be confused with *Victoire*). Large fruit, large crop, long season, early, flavour fair to good. Red.

Schöner Wienerin. Red, flavour excellent, but the fruit is very small.

Monstrueuse des Bois. Vigorous and hardy, large fruit, slightly musky, like *Hautbois*, but sweet as wild strawberries.

Monstrueuse Caënnaise. This has so much larger fruit than other Alpines that were it not for the morphology of the leaf one would suspect it of being a 'remontant'. It is of good quality.

Varieties with Runners

Note : if these are grown it is possible to let them increase into a solid mat, to form a wide border. The mat will exclude weeds when it is formed. It must be rogued for sick individuals,

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however, and the oldest plants systematically removed each season.

La Brillante. Resembles *Reine des Vallées* but, on the whole, inferior.

Belle de Meaux. Long season, small, long-shaped fruit, of good quality.

Ruhn von Dobelitz. Small, red and good.

Schöne Meisnerin. Red and yellow fruit. Quality fair, size small to medium.

Note on the words *Quatre Saisons*. *Quatre Saisons* is the French phrase which means what we mean by 'Alpine', in strawberries. But the expression is much abused in current usage, and in some parts of France, e.g. in the Alpes Maritimes, the ordinary strawberry of commerce commonly grown is called *Quatre Saisons* although it is one of the intermediate class between ordinary summer strawberries and 'remontant' varieties, which have two crops a year, one in summer and one in autumn. Thus, when a French grower talks of *Quatre Saisons* varieties, he may mean Alpines, but he may not. In addition to the Alpines named, the following are widely cultivated on the Continent: *Perle von Wienerwald*; *Gaillon Amélioré*; *Eryth Kind*.

VIII

THE LATE STRAWBERRY SEASON

(August to November)

For the purpose of our system of strawberry seasons, the late season begins in August and continues into November. I have picked fairly ripe strawberries from under unheated cloches as late as December 7th, but they were not of very good quality: in ripening early winter strawberries, a subject which I shall come to later (Chapter IX), the absence of heat seems to be less important than the want of light—although both are necessary.

The late season beds will be planted only with varieties of perpetual large-fruited strawberries, that is what the Americans call 'everbearers', the Germans *immertragende Erdbeeren* and the French *fraisiers à gros fruits remontants*. We have no word for this in English as no one has bothered to breed any of these varieties although they are the most interesting of all strawberries. As the word *remontant*, which refers to the habit of constantly sending up fresh flower trusses for months on end, can be used as adjective and verb as well as a substantive, I shall adopt and use it hereafter.

Plants of most varieties of the remontant strawberries are comparable with or larger than those of ordinary strawberries, but have much the same appearance, that is they differ sharply from the Alpine varieties. The fruit is also the same size as or larger than that of the ordinary strawberries, but very diverse in shape, according to the variety. Similarly, like the ordinary strawberries, nearly all the modern remontants make runners, and can be propagated by runner plants. In some cases the

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number of runners is extremely great—for example the American variety *Red Rich* is very copious in this respect. A certain number, probably not more than three or four varieties, make few or no runners and have to be propagated by crown or root division. But as to those, the great majority, which *do* make runners, these cannot be treated exactly as if they were ordinary strawberries: the habit of remontant fruiting means that the runner plants throw up flower trusses and set fruit almost as soon as they are formed, and before they are rooted.

I will run through a typical year in the life of a remontant variety.

The runner plants, extremely small, for they are chosen deliberately with a view to their immaturity, so that their remontant potential is high, are planted out late in autumn, probably not until mid-October, and given the same care as any other young strawberry plants. The planting distances will exceed those suitable for ordinary strawberries, however, as remontants grow enormous. This is in the case when planting in rows: there is another method which will be dealt with in its place.

The remontant plants will begin to grow very fast in March and will flower in late April or early May, depending on the seasonal weather and the site. Those first flowers must be picked off assiduously, and the de-blossoming continued until about May 20th. The object of this is to direct the energy of the plants into the roots and foliage and crown-formation, for the enormous strain of four-months' bearing which is to follow. In June there will be a short interregnum, followed by renewed flowering late in the month and in July. Some ripe fruit will be picked in July, more in August, during which month and in September the flowering becomes profuse beyond belief, some plants of some varieties carrying as many as sixty trusses at one time. The heaviest crop will be in September, but given good weather it will continue profuse through October, and the plants will still be covered with flowers and fruit in all stages of growth when cut down by frost in November. Early in October, or in September, the plants will be cloched, which may present special problems, owing to their size. The most prolific varieties will

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bear, in their four-months' season, as much as two pounds of fruit, or even more.

The dates in the above progress vary from variety to variety; some begin and finish earlier, others later, and it is difficult to give this variation as a set of rules, for it depends a good deal on site and microclimate. Some varieties are what the French call *hâtif*, by which they mean not only *early*, but early by reason of the rapidity with which fruit is formed and ripened. Another difference which distinguishes varieties is this: only some of them have the absolutely continuous remontant habit, others have, rather, several short cropping periods, separated by several interregna when they do not flower. Yet others are so different that they must be treated differently: these last are plants which bear an ordinary early summer crop, then rest, and bear an autumn crop in September/October. In the case of these varieties the April/May flowers must not be picked, but allowed to set, unless it is desired to put all the strength of the plants into the autumn crop—a wise commercial policy since strawberries fetch twice the price in September.

Remontant varieties bear such enormous crops in a single season—with some varieties ten tons to the acre is not uncommon and twenty tons not unknown—that they are said to exhaust themselves very rapidly. A second-year crop is possible, in fact common, from a plantation, but never a third, and the rule in France is to treat these varieties as annuals, replanting with runner plants every year. This is costly, but is rewarded by the quality of the crop. Replanting every second year is a better plan commercially. It is, after all, no more than *Royal Sovereign* growers are forced to do by reason of the debility of that variety.

SOIL, SITE AND MANURING

The choice and preparation of soil for remontants is much the same as for ordinary strawberries, but there are differences. The remontants are the grossest feeders of all strawberry varieties, and it is wise to increase the quantities of all manures by one-third when dealing with one of the remontants. Still more important

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—only one or two remontant varieties will stand drought, and then only partially. If these varieties are to be grown on any scale, provision for copious watering during dry spells is *essential* or total failure is certain. These varieties prefer a strong, holding soil rich in humus. They should also be mulched.

The site should have a southern exposure, and where possible some protection from the inclement quarters, since fruiting will continue into the autumn. Spring frosts are no problem, because we are not concerned with an early crop ; but October frosts will cut off the plants in full bearing. In getting fruit to ripen so late in the year, light is of the first importance, and therefore there must be no shade, but day-long sunshine exposure. Finally, the site should be well drained.

The runner plants are set out in October, the grower choosing the *latest and smallest plants which have not yet flowered*. It is desirable that they should hardly grow at all that year, but should start as youthful as possible in the spring : apparently the remontant propensity is connected with the *age* of the plant. The crop potential of a plant is thus greater if it begins the season very young with none of its flower-forming capacity used up, as it were.

PLANTING DISTANCES

These vary with varieties, but broadly speaking there should be three feet between rows and eighteen inches between plants. Plants of *St. Claude*, *La Sans Rivale* and *Record* may easily cover four or even more square feet when fully grown. These distances relate to ordinary row cultivation.

BLOCK OR MAT CULTIVATION

A different method of cultivation is suggested by the remontant habit of fruiting on their runners. If the plants are cultivated in rows, then it is best to de-runner them regularly, and force more flower trusses from the parent plant ; if it is desired to avoid this, then the block system should be tried. Its disadvan-

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tages are that it entails the growth of a mat of plants, which cannot be weeded, although annual weeds will not get a chance to grow, and that the mat of foliage produces conditions in which botrytis is liable to flourish. The crop from this system is probably rather heavier for an equal number of parent plants, but the berries will be smaller.

Each plant is given a square yard to itself, so that at first the block consists of a border a yard wide, and as many yards long as there are plants. The plant is set in the middle of the yard of soil. As soon as it starts to make runners these are simply allowed to root themselves, the only care being that of keeping them within the predetermined limits of the border or block. In time, and not very much time, the whole yard-wide area becomes full of plants all flowering and fruiting. When the season is over, say in October (for plants so grown cannot be cloched), the original parent plant and the earliest and largest runner plants are severed and removed, and the rest left. The system is thus permanent, and can usually be maintained for many years where the variety is resistant to virus. Eight years is considered the limit. Each November, the oldest plants are removed, so that there is constant renewal.

When planting, unless the soil is wet, the plants should be watered in and subsequently kept hoed to a very shallow tilth, and firmed after frost and thaw. In the early spring they should be watered with a weak infusion of dung or with a weak solution of blood.

With variation from variety to variety, flowering begins in late April and these flowers are all removed as described above up till about May 20th. Early summer fruit is not wanted from these varieties, and one French grower has asserted, what Major Corner confirms at the Coronet Perpetual Strawberry Plantations, that for every flower left to set before May 20th, ten strawberries are lost in the autumn.

Flowering begins again in June, in the case of the fully remontant varieties, but not until August or even September in the case of the two-crop varieties. In any case the grower of remontants has ripe fruit from July until into October, and to

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the end of October in good weather, later still if the plants are cloched.

Cloching, where it is to be used, should take place in September, about half-way through the month, unless the weather is very fine, in which case it can wait. The remontant strawberries grow very large, and ordinary barn, low barn or tent cloches are quite useless as they will not go over these plants. Where de-runnering has been practised, however, it is possible to tuck all but the largest varieties into tall barn cloches, and, of course, there is ample room under Ganwick type frames. The ventilation should be ample even in coldish weather, as stagnation of air will favour botrytis and mildew. Some special notes on the use of cloches are included below with the notes on varieties, as, in my opinion, special treatment of the plants, or rather of the crop, is desirable.

Under cloches, Ganwick frames or in greenhouses, setting and ripening continue well into November, getting slower and slower and more and more reluctant as the year ages, until, about November 10th, growth ceases, ripening ceases and the strawberry year appears to be over. It is not; but of that in another chapter. The limiting factor is not temperature, but light intensity. It is often quite warm enough under cloches in December in southern England to ripen strawberries, but there is insufficient light to maintain growth, which depends on photosynthesis. It is true that winter strawberries have been grown in heat for more than a century, with no artificial light, but success is very partial and, in any case, the subjects have been specially treated summer varieties, which have different habits.

Extra-selected strawberries packed in 'squares' fetch up to 17s. 6d. a pound in the late autumn. Selected, about 12s. In punnets, good quality strawberries of medium size will fetch about 8s. a pound. The late season is far more profitable than the early one, for there is no competition, as yet, and no imports. Marketing details are given with some of the varieties, since they differ according to the type of fruit in question.

As very little has been published in England about the re-

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montants I propose to give a rather long list of varieties. It is not suggested that more than one or two should be planted. The gardener will select his variety according to his needs.

VARIETIES

St. Antoine de Padoue (Thivolet)¹

Although this is one of Thivolet's seedlings and about ninety years old, it is still healthy and vigorous and shows no symptoms of virus when planted among infected plants. It has, however, merely an antiquarian or collector's interest, for although the quality of the fruit is fair and the habit fairly remontant, the total crop is small, and the berries are ugly—large, very rugged, and shaped like a long pyramid rather than a cone.

St. Jean

A healthy variety, with fruit of good flavour and size, blunt-conical in shape, very dark red when ripe. The crop is not large, and the habit only fairly remontant, the bulk of the fruit coming late in the summer or early autumn, with a flush again towards October.

St. Fiacre (Vilmorin)

One of the oldest varieties, the crop is not large and the remontant habit, although well established, sparse in its flowering, which continues unbroken from July into September whereas some newer varieties suffer an August pause. The best fruit is large, pine-flavoured, and heart-shaped. Runner production is good. I doubt whether there is any point in planting this variety, when newer ones and better ones are to be had. But the pine flavour is worth considering. It seems to be virus resistant.

La Sans Rivale (Chapron)

The plants when fully grown are shorter than healthy *Royal Sovereign* but far more bulky, with a sturdy upright habit, medium sized, dark green leaves with rounded lobes, and a

¹ Name of the breeder.

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rigid, dry feel to them. The whole plant is very bushy, the foliage copious, and may cover four square feet of soil, so numerous are the crowns formed. So that the planting distance should not be less than 2 ft. 6 in. Runners are numerous and flower as they form. The flower trusses rise from below the soil, are extremely numerous, especially in September, and even August. They are carried on stout stems taller than the foliage, each stem with many flowers and berries. The total crop is enormous, and may amount to two pounds per plant on the best plants, and at least one pound on an average plant. The variety does well for two seasons, but then degenerates or becomes less fertile. The fruit is fairly large, down to small, of perfectly regular conical or fan shape, a bright vermillion when fully ripe. In old strains the fruit does not ripen well towards the calyx, but in the later strains this fault has been eliminated. The flavour is good but not of the best; sweet rather than acid. This variety can be sent to market if packed as extra-selected in squares, or in one-pound punnets, but not in any other pack; it is not firm enough. Where possible it should be marketed near to the plantation, to avoid travelling, although it travels quite as well as *Huxley*, which is no great recommendation. It is my opinion, for what it is worth, that growers with jam contracts should consider this variety very seriously: since it crops in late summer all danger of loss of crop by May frost would be eliminated. The crop per acre would probably be about twice or three times that of our present commercial jam varieties, which would enable the grower to make a living even out of the miserable prices offered by the jam manufacturers. It is varieties of this kind which could knock imported pulps off our market. On the other hand the variety does not plug very well. However, it is well worth a commercial trial.

In my opinion the 'set' of fruit on this variety is excessive in late autumn. If cloched, at least a third of the flowers, and preferably two-thirds, should be picked off each truss, so that all the fruit obtained is of the *selected* size, and will fetch a price which justifies this extra labour. If this is not done there will be a mass of small, half-ripe fruit which is not worth picking.

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Triomphe (Chapron)

The plants are shorter and smaller than *La Sans Rivale*. They show some slight virus symptoms in their second year, and should not be grown longer. The habit of the plant is more sprawling than *La Sans Rivale*, almost repent, and the stems of leaves and fruit are weak and falling. The leaves are medium sized, cupped, the lobes pointed, the colour bright green. The timing of the fruiting is about the same as *La Sans Rivale*. The runners are copious and flower as they form. The fruit is either button shaped, that is oval in section and round in plan, and coarser in surface texture than *La Sans Rivale*, or, in the case of the largest fruits, which are enormous, the fruit forms a sort of bulging semi-circle about the calyx, which it almost encloses, and is then oval in section. The colour, when fully ripe, is that of a blood-orange, when nearly ripe it is salmon. The flavour is excellent, the texture rather soft and very juicy. There is no hard core, and plugging is easy, but the variety is quite unsuitable for market at any distance from the garden, for it is soft, will not pack safely and certainly will not travel. The prime fruit might be sold in squares, to a near market, in which case it should fetch a very high price, for it is spectacular. The fruit is very subject to botrytis, and therefore the planting distances should be generous, weeding assiduous, and the strawing careful and loose. Trusses with forming fruit should be pulled out from the interior of the plants where they fall, and laid by hand on the straw. The biggest berries are the ones most liable to the fungus, and half the best of the crop may be lost in a wet spell in August. The fruit, under cloches or frames, continues to ripen longer than *La Sans Rivale* and ripens more completely.

St. Claude (Rivoire)

One of the most beautiful of plants and of fruit. The plants are large, or very large, rosettes of copious foliage of a fine dark or medium green, with large leaves, although not as large as *Royal Sovereign*, lobes rounded and serrations numerous. I have never seen a shadow of a trace of virus symptoms, after three years.

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Runner production is not great, but sufficient. Although there is some flowering on runners, this is less marked than in the case of Chapron's varieties. The variety is at its best in August and September. The flower stalks being rather shorter than the foliage, it is necessary to search the plants well when picking, for they form very large bushes and it is perfectly possible to miss the best fruits. The fruit is large on the single-flower stalks, medium on the trusses. It is so perfectly regular in shape, a beautiful little blunt cone, that it looks like an artificial strawberry, and its brilliant colour and high gloss assist this illusion. The fruit is juicy, sweet, and of good strawberry flavour, not outstanding. The fruit travels perfectly well in two-pound punnets, although the large fruit is worth packing in 'squares'. *St. Claude* has until recently been considered by the French trade as the best market remontant, but its crop is not nearly so large as *La Sans Rivale*; moreover, it is difficult to cloche, owing to the lateral size of the plants at maturity. I have done it, however, only to conclude that the variety is not at its best after mid-September. In some sites and soils it is apparently much later than in east Kent, however, and should be given a trial by the planting of a pilot plot.

Général de Gaulle (Maillochon)

Although this variety is named as if it were stable, it is not, and I have cultivated twelve strains of it, of which, however, only two have proved worth the growing. These two differ from each other only a little, and after another season it will be possible to select one of them as superior, and suppress the other. The one which will probably emerge as the best is a handsome, rather light-textured plant, with copious upright foliage on slender stalks, and rather small leaves with pointed lobes. The fruit trusses are weak in the stem, at least in my soil, and the fruit resembles that of *Triomphe* in shape, though not in quantity, as the variety does not crop heavily. There is a rather long rest period between the first and second flushes of fruit, so that it is possible that this variety may have to be put into the two-crop class, rather than that of the true remontants. The flavour of the fruit is extremely

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good, but the berries are very susceptible to botrytis. Runners—few or none.

Inépuisable (Roland Chapron)

This variety, like all Monsieur Chapron's *obtentions*, is an enormous cropper, but as I have grown it only for a single season, I can pass no valid opinion on its merits. Briefly, the powerful growth and vigour of the plants suggest *La Sans Rivale*, and the fruit is larger, shapely and of good quality. Fruit ripens late in the autumn and more thoroughly than that of *La Sans Rivale*. I doubt whether the total crop is so large, however. Another season's experience may reverse this finding.

Charles (Géant) Simmen (Charles Simmen)

If I were planting one remontant variety for home consumption only, this is probably the variety I should choose unless I might prefer Monsieur Simmen's latest *obtention* (see below). *Géant Simmen* is an immense plant, when well grown much bigger than super *Royal Sovereign* plants. It is, however, not big in the same way as *La Sans Rivale*, having far fewer leaves but those enormous and rugged, and a far more open and graceful habit, instead of bushiness. The main crop begins earlier than *La Sans Rivale* and continues later. Single fruits are very large, and roughly spherical, rather shapeless on the whole, but of a very fine bright vermillion colour, darkening to nearly deep crimson in very ripe berries. The fruit is firm, resistant to botrytis even when resting on damp soil, fragrant and of the very best flavour—equal or even superior to *Royal Sovereign*. Smaller fruits are heart shaped. The total crop is moderate rather than large. Some plants are barren, and care should be taken not to propagate from these. Very few, if any, runners are formed, and for some reason these are not from the best bearing plants. Propagation is by crown division. The original plants were wretched little things and as they grew showed every symptom of severe eel-worm infestation which, however, mysteriously vanished as the plants grew, until there was not a symptom to be seen. They have hitherto shown no virus symptoms. The variety is not recom-

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mended for market, as the crop does not compare for weight with some other varieties, and the bad shape of the largest berries is against it. The remontant habit is continuous, with almost no rest period. The fruit is *hâtif* in forming and ripening. Cloching with large barn, or cultivation under Ganwick frames is easy and worth while after September 15th.

Record (Charles Simmen)

With this variety I am in a difficulty: it can be definitely better than *La Sans Rivale*—cropping ten to fifteen tons to the acre and forming plants covering nearly a square yard each. *Record* behaves like this in certain soils and conditions, but I have failed to determine with any sort of accuracy what these are. With me, the plants look very like *La Sans Rivale* and certainly crop heavily, but not at all as heavily as they should. The berries are blunt conical, very dark red when ripe, and of fine texture. The carriage of the plants can be very upright, and the stalks so stout that strewing is hardly necessary, but with me this ideal has not yet been attained. On the other hand, *Record*, arriving from France very late in its first season with us, was given the worst piece of ground in the place, the only space unplanted. It has now been moved to better soil and may perform more up to its form. The flavour of the fruit is better than *La Sans Rivale*, and it is sufficiently firm and fungus resistant. My impression is that, at its best, *Record* is incomparably the best commercial strawberry which could be planted, for Monsieur Simmen assures me that it is even possible to allow the early summer crop to remain on without impairing the autumn one. But *Record* is neither so stable nor so adaptable, and thus not so reliable, as *La Sans Rivale* or *St. Claude*.

Géant Framboisé (Charles Simmen)

Not yet sufficiently tested here, this variety seems quite likely to prove one of the most remarkable, and perhaps the epicure's remontant, unless it turns out to have serious faults. I publish a profile of a fairly typical fruit, which weighed 60 grammes. The

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total crop is heavy, and the remontant habit very steady and continuous, although one of the parents of the variety is not a remontant, but, and this gives the variety its musk flavour, the new *Muscade*. The other parent is *Record*. (It will be recalled that *Muscade* is said to descend from *Hautbois*—a remarkable geneti-



cal feat.) The variety has only been in commerce since the autumn of 1952. The only recommendation I can give as yet: try a few as a pilot plantation; this may be the Phoenix of strawberry varieties. Can be cloched. Runners, few.

Belle de Cossigny (Clause)

Vigorous, tall, erect plants, small crop of medium-sized, long-shaped fruit tasting of raspberry, i.e. of *Hautbois*. Possibly a true *Quatre Saisons* rather than a remontant! A botanist would perhaps be able to say. At all events, an amateur's variety, of no interest for commerce. Runners, adequate.

Bijou (Charles Simmen)

Very hardy, continuous cropper and the spring crop can be retained. The variety, probably a carrier, never shows virus symptoms. The fruit is too small for market, cherry shaped, sweet, fragrant and of very good quality. An amateur's variety,

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can be cloched spring and autumn, and will provide a small household with very good fruit for five months. Runners, adequate.

France Pacifique (Charles Simmen)

Short, stout, robust plants, continuous crop, very large fruit, sweet, high flavour. Runners, adequate.

Gabrielle d'Arbonville

Medium, stocky, strong plants bearing small round fruit of very good quality. The remontant habit is not sufficiently well established, and there are no runners. Possibly this is really a *Quatre Saisons* variety, but in that case the fruit is very large.

FRENCH TWO-CROP VARIETIES

I have chosen to take the following three varieties out of the remontant class, where the lists place them, and put them into a class of their own, to which, in all probability, the British varieties *Auchincruive Climax* and *Early Cambridge* may also belong, although in them the second-crop habit is not well established, and may possibly depend on a crop failure, for example due to frost, in June. The French varieties, however, crop in June and then again in September, but not in between.

Libération d'Orléans (M. Joly)

This epicure's strawberry is described in the epicure's list. It may turn out to be: (a) a perfectly ordinary summer strawberry in some soils and climates and strains; (b) a true and copious cropping remontant; (c) a two-cropper. Very unsatisfactory, but there it is; the variety has quality, and you cannot have everything—or not quite. Can be cloched. Thinning worth while. Runners, adequate.

Abondance (Louis Gautier)

Vigorous and hardy, medium-sized fruit, of good to very good quality and ripening very fast, so that the variety is useful in



Variety *St Claude*—July—from the author's garden.
Actual size; note regular shape



St Claude—September—from the author's garden

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changeable climates—for example parts of Wales and Cornwall. Crops in June and September. Can be cloched. Thinning not necessary. Runners, adequate.

Victoire (Maillochon)

This variety crops in May/June and then again in September/October, and so is very good for both very early and very late crop, under cloches, which, not being enormous, it fits very nicely, although large barns should be used and single-row planting. Foliage is a very beautiful bright green and magnificently healthy, rather short and very sturdy. The runners are numerous and do not flower until their second season, like ordinary strawberries. The fruit stalks stick out rigidly above the foliage in great numbers and all directions, so that plants look like a porcupine! The fruit is positively spectacular—very regular and shapely, large to enormous, truss fruit being medium sized. The colour begins as a creamy rose and darkens to deep rose—I have not seen this colour in any other variety. The flavour is good to excellent and sweetness remarkable. On the other hand, I doubt whether this will turn out a market variety, for the fruit is soft, bruises easily, suffers from botrytis, sometimes rotting before it ripens. But the variety is strongly recommended for the amateur and the connoisseur.

Alpes Maritimes 'Quatre Saisons'

This is not an official name, but just a way of designating a nameless strawberry referred to all over the part of France in the neighbourhood of Vence, as *Quatre Saisons*, which, in the sense *Alpine*, it is *not*. It crops at home in April and in September, which with us would be May and September/October, probably. I am trying it, but my experience of it is French, not domestic. It is probably extremely early, and pilot plantings should be tried by some enterprising nurseryman, if there is such a thing.

The following French remontants are not described because there are equivalents, superior in each case, to all of them in the above lists.

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Gemma	Merveille de France
Général de Castelnau	La Perle Rose
Mme Henri Routier	St. Joseph (the protovariety)
Mme Raymond Poincaré	Mme Simmen

American remontants (Amer. Everbearers)

There is a considerable history of Everbearers in the United States, some of which appeared in an earlier chapter. The first varieties seem to have gone out of cultivation, however, and although there are now a number, the tendency has been to reduce it, which is bound to happen when the commercial exploitation of plants is so highly organized as it is in that country. Four American varieties are now growing in the Coronet Plantations, and I have had the opportunity of studying Major Corner's results with them as well as growing them myself. Here they are.

Mastodon (G. Voer)

The plants are large, and not unlike *Huxley Giant* in appearance, vigorous and handsome. Runner production while not copious is ample. The variety is rugged and hardy, appears to be free from virus symptoms, and, it is claimed for it by its American distributors, is resistant to Red Core even when planted in infected soil. The fruit is produced in clusters at the tip of the fruit stalk, which looks rather unlike any European variety, but the berries themselves are the size and shape of *St. Claude*. It is doubtful whether this variety should be considered as a true remontant: it is rather a two-crop kind, and it is in fact usual to allow it to bear the spring crop, which is good. The autumn crop is not large, by French standards, and not entirely reliable. The flavour of the berries is fair, and rather acid.

Gem (origin unknown)

Smaller and weaker plants than *Mastodon* but runners more numerous. No particular disease resistance is claimed for this variety as far as I know. Its spring crop is not worth having and the plants should be de-blossomed until the end of May. The

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rest period before the late summer and autumn crop, is long, by French standards. The late crop is large and reliable, the berries of medium size, light red in colour, and very even in ripening. The flavour is very acid by our standards, although the fruit is pleasant with sugar. It is claimed for *Gem* that it is a suitable market variety, the berries being firm. I have not marketed any myself.

Superfection

This appears to be identical with *Gem*. In a note in their catalogue, Messrs. W. F. Allen, of Salisbury, Maryland, say that they can find no difference, but on the other hand *Superfection* appears to be the more productive of the two, comparing favourably with *St. Claude* although its season is shorter. It compares unfavourably with *La Sans Rivale*, although the berries are, on the average, larger, and prettier, not unlike *Record*, although not nearly so copious.

The fruiting habit is like *Mastodon* in appearance, and so are all the American varieties—which suggests a common ancestor (*Pan-American*?). Another varietal name is *Brilliant*, but its plants are absolutely indistinguishable from *Gem*. The most likely explanation appears to be that *Brilliant* and *Gem* are regional synonyms for the same variety, and that *Superfection* is a superior strain of *Gem* selected by its originator.

Red Rich (origin unpublished)

For what it is worth, my opinion is that this is the best, and the only, American variety which it might be worth our while to plant here, considering that the French varieties are available to us. The plants are rather like a bushier version of *Charles (Géant) Simmen*, in fact, until fruit appeared, I was suspicious that it might be an American name for that superb variety. It is not. In the first place, whereas *Géant Simmen* makes hardly any runners, *Red Rich* makes—I nearly wrote *millions*! In this respect it is a joy to the nurseryman and a damned nuisance to the fruit-grower. The total crop of *Red Rich* is not among the largest, but the quality is good, even very good, although with a good deal of the tartness which distinguishes American strawberries, so

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that they need more sugar than ours. For the gourmet it is a good plan to grow some *Red Rich* with his other remontants, and serve a mixture of these Americans with some sweet variety, such as *Victoire*. The fruit is very handsome, dark red, and perfectly regular conical, not unlike *St. Claude* at its best. It ripens slowly up to the end of October.

So much for the American varieties. There are a number of Austrian varieties of which only one has been sufficiently tried for report here.

Kuntner's (Pineapple) Triumph (Kuntner)

The plants are sprawling, rather weak but very rapid in their growth, with a good colour and medium foliage, not unlike their namesake among the French group. The strawberries are of medium size to large, rounded or heart-shaped, and alleged to be of marked pine flavour. I was unable to detect it. But Major Corner reports that with him it is delicious. On the other hand, they are not growing in good conditions here and it may be that flavour will be better when the soil and site are improved. It is acid, however. The variety produces copious runners, and the runner plants flower as fast as they form, and it is usual to grow the variety as a matted bed, in the manner described at the beginning of this chapter. The variety is a large cropper, producing up to one pound per plant in its long, continuous season. There are such wildly enthusiastic reports of this variety in Austria, and its export has been banned by the Austrian government, that I can only suppose either that the Austrians have not much experience of remontants and think they have a miracle; or that the variety has not performed up to form in this country. Ripening continues to the end of October, without glass protection.

GERMAN VARIETIES

Ada Hertzberg (G. Hertzberg)

(Note: only one season's English experience with this and the other Germans.)

Very large and handsome plants with adequate runners. Some

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plants have as many as 150 fruit at one time, of a brilliant red, rather long and pointed berries, and the flavour good. My own strain of this variety is apparently already out of date, but the new strains which are being planted here are too young for any report yet. The fruit of *Ada Hertzberg* is very firm, and would probably be suitable for market. While it is difficult to be sure of any variety until at least three years have passed, and preferably five years, this appears to be good. It is a true remontant, although its heaviest crop is well into September. This variety colours and sweetens in the most extraordinary fashion without glass, well into November! It seems to enjoy the shorter day.

Three other German varieties have been tried, namely *Holstein*, which is quite good but probably not as good as *Ada Hertzberg* on most counts. *Holstein* was raised by Herr M. Sturm. Neither *Herbstfreude* (O. Schindler) nor *Heinemann's Unerschöpliche* (G. Hertzberg) seem to be as good as the first two, and it is therefore not necessary to describe them. Indeed, it is not in the past or current varieties of remontants, but in the future ones from Germany such as *Hamburg* and *Hertzberg's Triumph*, that interest lies for, encouraged by the results obtained to date, the German research workers, nurseries, and amateurs are going all out for a perfect remontant and, knowing the Germans, they will be worth watching.

Varieties of remontants from Scandinavia and other European countries are now being planted for trials at the Coronet Plantations and with me. Nothing can be said of them here, but what is very obvious is that Britain, which did so much of the best early work in the creation of fine strawberry varieties, and which does still do the best of all work in disease research and attempts at pest control, has been left very badly behind in this by no means new, but now suddenly flourishing, branch of strawberry culture. It is humiliating to have to admit that the greatest gardeners in the world have no autumn strawberries, no remontants, with the partial exception of *Climax*. It is obvious that in *Early Cambridge*, in *Climax* and possibly in *Royal Sovereign* we possess three good varieties which, crossed with the most

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remontant of the French varieties, might well give rise to very interesting remontants. Possibly somewhere in England or Scotland, some plant-breeders are already working on these lines and will arise to confound me with a variety as large as *Record*, as prolific as *La Sans Rivale*, and with the flavour of a *Vicomtesse Héricart* or a *Géant Framboisé*. I hope so. I have started a little quiet experiment of my own, using *Royal Sovereign* pollen on several of the remontants, but I do not anticipate good results, not being competent at this delicate work. Let someone who is, make a start.

With a selection of the varieties described in this chapter, and with the aid of cloches or frames after mid-September, the amateur or the market gardener can pick ripe strawberries throughout the months of August, September and October, and even into November. Thus, from April to October inclusive, is all strawberry season without any aid more artificial than ordinary cloches. That is seven months of the year, or rather, to be perfectly fair, six and a half, for we get few or no ripe fruit before the middle of April, even with the earliest varieties, and although remontants do ripen a few berries in early November and right through the month in a mild season, it is clear that once we are into November, the plants are no longer really growing, and their life tempo becomes sluggish and sleepy.

It is, however, perfectly possible to continue to ripen and gather strawberries in the remaining five months of the year, that is from November to March inclusive, and well into April, by more artificial means. It should be made clear at once that for this purpose considerable outlay is necessary, and much skill; and that the fruit gathered will be very expensive. The grower who wishes to try this winter culture on a commercial scale can count on prices as high as 60s. a pound for selected fruit in mid-winter. But the cost of growing the fruit is very high indeed.

The following chapter deals with two methods of forcing strawberries: one employs ordinary summer varieties, and is classic, although much modified of late by work with artificial light. The other is a method first tried by the author in east Kent, using remontant varieties, the principle of which is quite different.

IX

STRAWBERRIES OUT OF SEASON (November to April)

Those who want strawberries really ripe in November, and they will fetch a handsome price, need go to very little special trouble if they have a slightly heated greenhouse, or frames. Any of the good remontant varieties will, in any case, continue to colour under cloches provided the season is mild. But ripening may be only very partial, and to be sure of a crop, then plants, either potted, of which more anon, or planted out in frames or greenhouses where some heat can be applied, should be relied on. Potted plants can simply be moved into the greenhouse from the open, where they will have been cropping since August. Or, alternatively, remontant runner plants can be potted up in June or July, or even in August, de-blossomed until the middle of October, moved into the greenhouse in early October, and there cropped until the days become so short that growth almost ceases.

As the details of this method are the same as those for the more difficult work of getting mid-winter fruit, nothing further need be said here about the month of November, excepting that the day-time temperature of the house or frames should be not much under 70 and the night-time figure not lower than 55° F. Ventilation should be ample, if only as a preventive against fungus troubles.

THE WINTER CROP

As I have said, there are two methods of getting winter strawberries, and it is becoming clear that they supplement each other, in that whereas it is very difficult to get a crop early in the winter

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from the ordinary summer varieties, but not quite so hard to get a crop later in the winter, it is easier to get strawberries from remontant plants early, and more difficult to get them late. Nevertheless, if I had to choose, I should take the remontant varieties, because, as I have proved by experiment, it is not difficult, although it is costly, to keep them growing and cropping throughout the winter.

Here, to begin with, are some generalities. The nature of the ordinary summer strawberries is to begin growing in March, to be in full growth in April, to flower in May, and ripen fruit in June. From July until September growth continues, and then it becomes slower and slower and the plant enters upon a period of rest which lasts from some time in December until some time in February. The whole of this process is governed mainly by two things: temperature and light. Of the two I believe that light is the more important, a belief based not upon experiment but upon this observation: that commercial growers of very long experience assure me, and I have seen for myself, that whether the season is hot or cold, wet or dry, the day upon which they begin to pick does not really alter much from year to year. In a very cold spring the plants will still begin growing and enter upon flowering, just as they will in a very warm spring; no doubt there may be a day or two of difference in the date of ripening, but it is far less than one would expect. If this be so, then it is clear that either the plants have some innate sense of timing, so that they may be said to 'know' rather than to feel when the time to grow has come; or respond to some inner reaction which comes about independently of weather, after a certain number of days' dormancy. Or, they respond to light. I am not prepared to dismiss the first, and rather fanciful, hypothesis with a *quod absurdum est*. What do we know about plants? Extraordinarily little. Anyone who has stood patiently beside a grape-vine and watched the tendrils respond with a grasping movement to a light tap with a straw will reserve his judgement as to the nature of the plants' response to their environment. But at all events, it is easier to understand the behaviour of plants by reference to tropisms of biochemical origin, or biophysical origin, than in

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terms of mysticism. And so it seems fairly clear that it is light intensity and duration which govern the behaviour of strawberry plants, as of other plants.

If light is more important than heat in starting and maintaining the growth of strawberry plants, nevertheless there are certainly limits of temperature outside of which the plants will not behave normally. But there is also another important point connected with temperature: during the post-crop period of growth of ordinary strawberries, nutrient material, that is protein, is stored in the plant and some of it must go towards the creation of potential flowers and, that is, fruit. But it is quite clear that the completion of this process is to some extent dependent upon some kind of hardening which is due not to warmth but to cold. Supposing one takes into a hothouse young strawberry plants, 'maidens', but well grown, which have never suffered any weather more severe than that of late autumn, with no frosts. And supposing that these plants are 'forced', a process which will be explained hereafter. In that case, from 50 to 70 per cent of the plants will bear some fruit, while the rest will remain barren, although they will respond to forcing by growing. But supposing that *before* being forced the plants are exposed to some days of real winter weather, say ten days of moderate frosts: in that case the proportion of plants which flower and bear fruit will be higher—say from 60 to 85 per cent. And the total quantity of fruit obtained will be greater.

There is next the even more important question of light. It is evidently necessary to the formation of fruit buds, as against leaf buds only, that the plants should enjoy a period of dormancy. It is, indeed, important that before they have to submit to real cold, they should be dormant. Now, if a plant is taken into the greenhouse or hothouse in autumn, before it has stopped growing, and before it has entered into its period of dormancy, it will, if forcing starts at once, be prevented from ever becoming dormant, and undergoing those mysterious biochemical changes which ultimately give rise to fruit. In short, it is perfectly permissible to say that a plant, like an animal, must sleep; but whereas animals, for the most part, wake and sleep

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part of every day throughout the year, plants wake throughout the summer months, and sleep throughout the winter.

What follows, of practical use, from these observations? That if it is desired to get fruit from strawberry plants of ordinary summer varieties, during the winter, then some attempt must be made to simulate, from their point of view, those conditions which bring about dormancy, before the plants are submitted to forcing. In detail, this means that the amount of light with which the plants are irradiated must be reduced during many weeks before forcing starts; and that the plants must be submitted to cold conditions, if necessary artificial. An ordinary summer variety of strawberry will ripen its fruit in June: we require it to ripen fruit in, say February—that is to bring forward its ripening time by four or five months. Now, in practice, it is possible so to upset the plant's metabolism by applying unseasonal warmth to it, that it will bear fruit out of season if it is given a much longer than normal time to do so. But it is probably easier, and will have better results, if we can, to some extent, bring forward the autumn and early winter from the plants' point of view, and so prepare it for forcing.

I shall deal with the details of preparing for forcing, in their place. The point to grasp is that since photosynthesis cannot be hurried, although the intensity of light has *some* importance, the *duration* of light has more, and that therefore the rate of growth of a plant is a function of the length of day. But the day can be lengthened or shortened artificially, as we shall see. One thing is very clear—in view of the importance of pre-crop dormancy, and of length of day, it must be very much easier to get strawberries in February, March and April, than in December and January. And this is, in fact, the case and the French worker, A. Petit, established it experimentally, showing that:

Where forcing began on	Ripe fruit was picked on
December 15th	March 16th
January 4th	March 20th
February 1st	April 14th
March 20th	May 15th

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The heat applied to the experimental plants, which were of one clone, and planted in identical soils, was the same throughout. No artificial light was used. And yet whereas when forcing started on December 15th, ninety days were required to procure the first ripe strawberry, when January 4th was the starting date, only seventy-six days were needed to get the same result, while when forcing began on February 1st, the time was a little shorter again, and so following. Why? Length of day. By January 4th the days had begun to lengthen.

Now comes the question of the months of December and January. From all the above it is evident that to have any chance of getting fruit from ordinary varieties in those months, it would be necessary to submit the plants to an artificial shortening of the day from July onwards, and to submit them, also, to low temperatures, for at least two weeks, some time in August or September. This can be done and has been done experimentally, and the plants respond: but it has almost no commercial possibilities—the labour of darkening the plants in frames, and of refrigerating them or, alternatively, of dipping them in ether (a substitute hardening of dubious value) is costly. There is, however, now an alternative, that of preventing plants which, in any case, throw fruit trusses all the time they are growing, from ever becoming dormant—in short, of prolonging by two months or more the season of autumn fruiting. Obviously, for this, we have to use remontants.

The general principles here are much the same, although the nature of the remontant varieties seems rather different from the ordinary varieties—in fact, it is downright ‘unnatural’. The remontant varieties are in full flower and fruit when cut down by frost. They do not enter upon a period of rest with the dignity of the slowly drowsing ordinary variety. They, as it were, plunge from waking into sleeping like the phenobarbitone addict.

Now, it is by no means easy to wake a plant from dormancy once it has entered upon that condition. Note, for example, the very very slow waking of Petit's plants which were forced from December 15th. It is, however, possible to prevent dormancy, to keep the plants awake. This serves little purpose with the ordin-

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ary varieties, for until they have undergone dormancy, they do not bear, or not well. But the remontants are in full career at the very moment when the shortening day and the falling temperatures are tending to put them to sleep. What happens if, by artificial means, we maintain the day at such a length, and the temperature at such a degree, that mild autumn conditions must seem, to the plants, to continue prevailing? In that event the plants keep on being wide awake.

Without apology for these generalities, I can come now to brass tacks.

DECEMBER–JANUARY

As, in practice, it is better to have plants with all their potential fruiting in reserve, than plants which have been fruiting for months on end, I do not, in fact, use old plants.

In July go over the rows of the remontant variety to be used for this winter work, and select enough runner plants on rather long runners for your purpose. Do not separate them from the parent, but if they have already rooted, dig them up. Prepare a sufficient number of ten-inch pots by putting in plenty of drainage material, and a compost formed of one part good loam, one part sifted animal compost very rotten and old, and one part leafmould, the whole reinforced with dried blood at the rate of one tablespoonful per pot. Mix very well indeed, add a few spadefuls of sharp sand while mixing, and fill the pots to within an inch of the rim. Stand the pots along and beside the row of remontants, and plant in them those selected runners which have rooted, or peg down those which have not. Keep the pots watered: in a week all the plants will be well rooted. As soon as you cannot easily twitch them out, so that they are surely rooted and holding tight, separate them from the parent, and stand the pots all together in full sunlight, where they can readily be reached. For the next month or so the following work is then necessary:

- (i) Weeding the pots—compost usually has some weed seeds, and leafmould always.
- (ii) Watering to keep the soil moist but not sopping wet.

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- (iii) Immediate removal of runners as they form.
- (iv) Search, at the base of the plants, for embryo flower trusses or bracts, and their immediate removal before they can form. This is important.

The plants will grow very fast and become quite large in a few weeks, especially if real care is taken to remove flower bracts as they appear, which they will do with increasing frequency as the plants grow large.

On a site which is exposed to full, unshaded sunlight all day long—even in winter when shadows are thrown from distant objects—dig a clean trench a good foot deep and a spade and a half wide. It must be long enough for all the pots to stand in it, with three or four inches at least between them at the rims. If several short trenches are preferred to one long one, they must be the width of a large barn cloche, plus two inches, apart. These trenches must be dug near the house or near to a source of electric current.

Early in September, put the pots into the trench, standing them in the middle. Now, down each side of the trench, between the sides of the pots and the sides of the trench, place soil-heating elements of concertinaed galvanized iron wire as supplied by the makers, using the maker's instructions as to the loading required to maintain a soil temperature around 65° F.

The terminals of the elements should be led out on the end of the trench nearest to the electric point, of course. At the point where these emerge from the trench, instal a soil-heating transformer supplying a 24-volt output. Connect up the elements to the output terminals of the transformer. If all this is beyond you, obtain the help of an electrician, or you may burn out the transformer quite easily. The transformer should be covered with a suitable box, such as a tea-chest of three-ply.

The wiring of the transformer to the mains and the provision of a switch and a fuse should be done by an electrician unless the grower is skilled in electricity. Otherwise the chances of killing someone are excellent—electricity and wet soil do not make a safe combination for the unskilled.

The trench must now be filled in, so that elements and pots

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are completely covered, and the plants look exactly as if they are growing in the soil itself.

Alternatively to the above method, which is exactly what I did but which was designed to enable me to remove the plants, in their pots, for an exhibition in February, it is perfectly possible to root the runner plants in four-inch pots, and then plant them in rows after making the trench, burying the heating elements, and refilling the trench with compost. The pots, in fact, are not necessary.

But in that case the preparations—setting the heating elements, making the compost, and knocking the young plants out of their small pots and planting them in the compost with which the trench has been filled—must all be done much earlier, in fact early in August, for the plants will not grow in small pots used for rooting them. And, again in that case, the weeding, de-runnering and de-blossoming are all done *in situ*.

In either case, with all in place, large barn cloches are put over the plants on September 15th, with ventilators open; and watering, de-blossoming and de-runnering are maintained as before. The current is not yet switched on, of course, the soil and air being still warm, for sunshine is still hot in September.

My own method of proceeding after these preliminaries was as follows. A 5-amp cable was run the length of each row of cloches, inside the cloches, by attaching it at intervals to the cloches wire, just beneath the ridge. This cable had been fitted, at intervals of just over two feet, with ordinary lamp-holders of the bayonet socket type, carefully taped where the cable entered them, to exclude water. All these sockets were, of course, connected in parallel, the cable being two-core. The cables from each row were joined, again in parallel, at a junction box mounted inside the box covering the transformer. But they were not supplied with power from the input side of the transformer, as could have been done, since it was obviously desirable that the controlling switch should be inside the house. So a further cable was run to the distribution board, in the house, and there connected, by way of a fuse and switch, and through a special meter fitted free of charge by the most helpful and co-operative officers of

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the South-Eastern Electricity Board, to the mains. This meter enabled me to keep account of the power consumed in the experiment, and thus to get some idea of the cost of growing winter strawberries.

Meanwhile, I had a row of plants exactly similar to those under cloches, growing in the open. The object of this was to have a 'control', so that we might know when, for example, growth began to fail. As soon as that occurred, it was decided that forcing should begin. Also thermometers were kept stuck into the soil under the cloches, and, when it was observed that growth in the unprotected plants was, in fact, becoming sluggish, the current to the soil heating units beneath the cloched rows was switched on for long enough to keep the soil and, by the way, the air space, at a temperature in excess of 65° F. No thermostat was used, for these are often unsatisfactory at low voltages; but it would have been useful to have one, for an hour's unexpected sunshine would sometimes raise the temperature under the cloches to 80° F. which I considered too high.

As soon as the heating and lighting began, the season decline into dormancy was checked, and new growth started in a satisfactory manner, the plants throwing ample new foliage and many flower trusses which, at first, were picked off as fast as they appeared. In warm weather in the day time, soil heating was discontinued, our guide being the thermometers stuck into the soil at intervals. As to the lighting, we made a simple rule: it was switched on at sunset and during October was switched off at ten-thirty. During November it was switched off at eleven-thirty, and during December not until after midnight. After mid-winter, we shall again shorten the hours of light treatment.

During October watering was necessary, but thereafter the soil did not dry out, remaining quite moist for weeks at a time, which I attribute to the fact that the cloches were never opened. We relied for ventilation on the difference in temperature without and within the cloches, which must have forced a movement of air. At all events, we had no fungus troubles.

As it happened, we had a number of unusually severe frosts in November and although, of course, the heat was on night and

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day, a few flowers were damaged, notably those furthest from the soil and nearest to the glass. While the lights were on, however, no frost formed on the glasses of the cloches even in the harshest weather, the lamps acting as very effective space-heaters. But since extra heating was often required after the time to switch off the lights had passed, it would have been desirable to have some kind of space-heating in the form of galvanized-iron wires of suitable gauge carried on asbestos rods three inches above the soil and supplied from the 24-volt output side of the transformer.

Short of holding back this book from the press for two months, it is not possible to give here the final result of this experiment. A further report will be published in the horticultural press in due course. This is being written on the 16th December 1952, at which time it is possible to state that under the conditions described above:

1. Growth is maintained, although it is slower than during the summer.
2. There are no cases of barrenness: all the plants are carrying flower trusses, some as few as three, others as many as twenty.
3. The variety *Triomphe* has responded more satisfactorily than the variety *La Sans Rivale*, producing more flowers and less foliage.
4. There can be no difficulty whatsoever in getting fruit by this method throughout December, January and probably into February, but hand setting must be used.

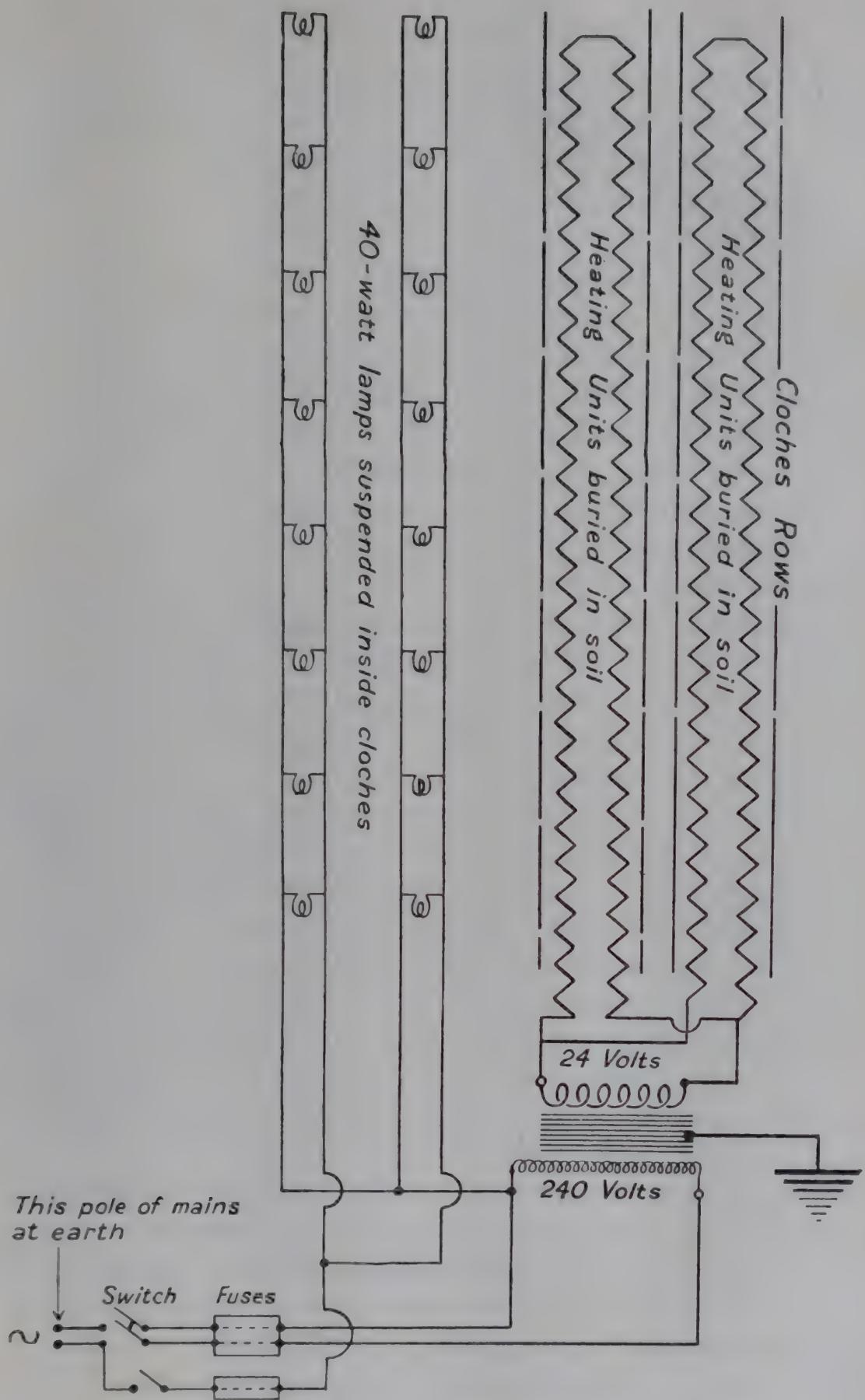
At first, after we had stopped picking off the flowers, we did no hand fertilizing, as I wanted to see whether ground insects, active in the warm cloches, would do it for us. They did not, nor did any draught there may have been in windy weather distribute the pollen. Flowers proved to be very long-lived in these conditions but they did not set, until hand fertilization was resorted to, when setting was satisfactory. Considering the fact that a high air-temperature is desirable for good setting, we proceeded as follows: the lights were switched on two hours before we started



From the Coronet Plantations, Paignton, Austrian collection: *Kuntner's Pineapple Triumph*. Photographed 21st October 1952, some leaves removed to show fruit



From the American collection of the Coronet Plantations, Paignton: *Red Rich*, 21st October 1952. Some leaves removed to show fruit



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going over the rows with a rabbit's tail or camel-hair brush, so that we not only did the work in a well-warmed atmosphere, but in bright light which, if it was greatly inferior to sunlight, was an improvement on gloomy winter days.

So much for the use of remontant varieties to obtain winter strawberries in December, January and into February. There is no doubt that February presents the greatest difficulty, and this is also true in the case of forcing ordinary summer varieties for winter fruit, so that I shall omit that month, regarding it as something of a blank in the strawberry year, and come to March and April. With those two months complete, the year will have been also completed, and it will have been shown that ripe strawberries may be gathered round the calendar, with the one dubious month of February.

I shall deal with two methods of getting late winter or rather early spring fruit: the first is an old and tried one; the second modifies it by the addition of artificial light. I have personally used neither and my knowledge of both comes from experience of French commercial practice, and reading the literature of more recent experiments. In the case of both methods the varieties used are the ordinary summer strawberries, not all of which respond equally well: *Royal Sovereign* can be used, and is used commercially for April fruit. The varieties which seem to have given the best results in the past were *Vicomtesse Héricart de Thury*—possibly chosen because it was, and is, the best-flavoured strawberry—and *Deutsche Evern*. So far as I can determine, there was no particular reason for choosing the latter variety, and possibly our own *Early Cambridge* would be worth trying.

First, some theory: the time taken to produce ripe strawberries in early spring without artificial light has already been discussed: it is about ninety days and the chances of success are greater if the plants are first artificially wintered. As we saw, a strawberry expects winter rest, and if it does not get it may not reach that stage, physiologically, at which it can bear fruit. If fruit is wanted in March, then forcing must begin early in December, when dormancy will be partial, and perhaps no real winter may have been experienced. It is safer to provide one.

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Runners of the variety to be forced should be pegged directly into four-inch pots, or soil pots, as early as possible, preferably in June. As soon as sufficient plants are rooted well, they should be transplanted, into ten-inch pots filled with a compost similar to that described above, if a hothouse is to be used for forcing, or into a trench filled with compost above soil-heating elements, if you wish to experiment with heated cloches. I shall continue this account assuming that the hothouse is to be used, and the reader who wants to try cloches can make his own modifications.

The pots will be stood fully exposed to sunshine during July, August and September, watered when necessary, and the runners picked off the plants as fast as they show themselves. Early in September the pots should be put into a frame, or they can be stood in a rectangular figure and boards or bricks built round them. Beginning about September 5th, and throughout the month of October, the frame will be very closely covered with two or three layers of sacking, tightly secured at each edge, for as many hours of each day as will allow the plants to receive only eight hours of daylight. It is necessary that the covering be really lightproof, for photosynthesis will continue in the presence of surprisingly small amounts of light. In November, it is to be hoped, there will be some days of sharp frost, to which the plants should be exposed. In the absence of cold weather, there is little to do, unless one happens to know a friendly butcher with an enormous empty refrigerator, to simulate cold weather. Experiments have been made in finding substitutes for cold, to harden the plants by some other means. For example, immersion in ether, for some hours. The results which I have studied seem to be negative, the very small apparent gains being statistically insignificant unless, indeed, they show that the experiments were carried out with too few subjects. At all events, if the plants *can* be submitted to temperatures below 32° F. for ten days, so much the better.

At the beginning of December they should be moved into the hothouse. They are arranged in convenient lines on the benches, with ample room between plants so that foliage is free and well aired all round. The temperature of the house must not be high

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at first: during the first week it should be 50° F. during the day-time, and dropped to 45° F. or even a shade less at night. These figures will be slowly raised, until by the end of the second week they reach 60° F. by day, and 50° F. at night. Soil moisture should be just maintained by frequent slight watering with warm water. Keep the soil in the pots hoed with a stick or pen-knife.

Growth will begin and will only be definitely checked if conditions are exceptionally overcast, and light very poor. Incidentally, the plants must be as near to the glass as possible—nine inches for example, and the glass absolutely clean. The temperature may be raised a little above 60°—say to 65° F. during the day, but kept to 50° at night.

At the end of January the crowns of each plant must be closely examined for embryo flower trusses which should be appearing. The number of plants which produce them will depend very much upon your success in hardening them before growth started—either by luck, with sharp cold in November, or by artificial means. Failures will be numerous even so, when the December weather has been very cloudy and dark; a sunny December will mean a higher proportion of successes. At all events, the plants which show no embryo fruit trusses should be removed from the hothouse at once; they may be as many as 50 per cent of the total, and there is no point in giving them attention.

As soon as the flowers open, another consequence of poor and short light will appear. Some flowers will be deformed, with only rudimentary petals, stunted stamens, and no viable pollen. Such flowers will not produce satisfactory fruit. In a dark winter they will be numerous, in a light winter very few.

When the plants are in flower, the ventilators of the house should be open between ten in the morning and two in the afternoon, unless the weather be very severe, and, meanwhile, the furnaces boosted to keep the temperature at 65° F. despite the influx of air. For the proper fertilization of the flowers it is necessary to have a dry, fresh atmosphere.

The flowers will begin to be open and ready for fertilization in February, when there are no pollinating insects about. Some

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of the work of distributing pollen will be done by a draft from the ventilators on warm days, but to be sure of setting fruit hand fertilization must be carried out. A small water-colour brush or a rabbit's tail is used. The brush is rubbed gently on to the stamens so that some pollen adheres to it, and this is gently transferred to the pistil of another flower. If these are ready for pollen they will be covered with viscous fluid to which the pollen sticks, whereupon fertilization takes place. This work should be done at noon, preferably on a sunny day, and with the temperature boosted to 75° F. The flowers should be dry. If the work is carelessly done, deformed fruit will be the result.

As soon as the flowers begin to fade and fruit to swell, the temperature of the house by day should be kept above 68° F. and up to 60° F. by night. Watering should begin again, and occasional light syringeing. At no time must soil or plants be drenched. Once a week, manure water can take the place of plain water. Fruit trusses should be propped up on stiff wires stuck into the soil, so as to be exposed to light and air. Ventilation should be increased whenever weather permits this, for plenty of air will improve the flavour and the colour of the fruit. Imperfect fruits and unfertilized flowers should be pinched off.

Within the limits already stated, the date at which ripe fruit may be expected depends upon two factors : the amount of light the season has afforded ; the variety grown. The figures already given were for *Deutsche Evert*, and a good many days can be knocked off them. For such *hâtif* varieties as *Hâtif de Caen*, *Surprise des Halles* and, probably, *Cambridge 173*, and in a favourable season, it may be possible to get ripe fruit after only seventy-five days ; that is, there should be ripe fruit from about March 1st. An extra ten days must be allowed for mid-season varieties. From the first to the last ripe berry on all plants of a single variety about twenty days will elapse. With these figures available, the date of picking from March 1st until the time for picking the cloched crop starts, depends simply on the date at which forcing is started, bearing in mind the contraction of the start-to-finish time as the year ages.

To obtain a considerable crop by these methods, a large num-

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ber of plants must be grown. The skilful French grower reckons to get twelve fruits of selected size from his very best plants, only eight from most of them.

METHOD TWO. FORCING WITH ARTIFICIAL LIGHT

In this case, instead of faking dormancy conditions to create a false dormancy, we prevent the plant from sleeping at all; but it must in that case be older. The plants chosen should be maidens planted the previous autumn, de-blossomed in the spring, and then grown on in large pots throughout the summer, with the usual care and attention such as de-runnering. Such plants will be in a condition to bear fruit without a further dormancy, as they will have undergone one already and not yet carried a crop. In their case, what we are going to do is to bring forward the spring without a preparatory winter.

The principal advantages of using artificial light, as well as heat, are independence of winter weather—it no longer matters if the sky is overcast and there is no sunshine; a higher proportion of fertile plants and the reduction of the time elapsing between the beginning of forcing and the gathering of fruit by as much as one month. The expense is, of course, increased but, possibly, in commerce and on a large scale the larger crop due to fewer barren plants and deformed flowers may balance this out. In that case, lighting in the hothouse will be worth while. It is a matter for controlled experiment.

In experimental work, it was found necessary, by using light of low intensity, first to prevent the plants required to bear fruit in January from becoming dormant. This was because once the plant has become dormant it is extremely difficult to wake it up, and takes a very long time, as is apparent when forcing is being done without light. It requires far less light to keep the plants awake than it does to wake them up once they have fallen asleep.

Dr. J. W. M. Roodenburg, working at the Wageningen Horticultural Laboratory, found that ordinary incandescent electric lights at the rate of about 40 watts per square yard of plantation

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surface to be irradiated, and used from October 1st for seven hours a night, were adequate. The plants in this experiment were *Deutsche Evern* and the actual light intensity is given in Dr. Roodenburg's paper on the subject as 20 *lux*. But this low intensity lighting served only to keep the plants from becoming dormant, and in order to force the formation and ripening of fruit at a rate significantly greater than would have been the case without light, a much greater intensity was found necessary. From some time in November—say the middle of the month—the intensity of light was increased to 500 *lux* per yard, apparently given by the neon-tube equivalent of about 1 kva incandescent for six to eight hours a night. Neon tube was used for two reasons: the red component of light seems to be important; and neon tube is far cheaper to drive than incandescent lights.

In Dr. Roodenburg's experiment it was required to ripen fruit in January, and even December. In the case of later ripening, say March and April, light of lower intensity would give some advantage. In the latest experiments, mercury vapour tubes are being used, for it has been found that the *quality*, the composition of light is of little significance, all that matters, in getting ripe fruit, is the intensity and duration of light. Moreover, you cannot make up for short duration by increased intensity. For example, if you find that you get good results by irradiating your plants at the rate of 100 watts per plant for six hours a night, you will *not* get the same result if you double the wattage and halve the period. There is an optimum rate at which plants can make use of light, and beyond this point greater intensity is of no use at all, but is wasted. Time is the important factor, once the intensity has been raised to such a figure that the plant is getting all the light it can use. Just what this figure may be has not yet been established by experiment, as far as I know, and it is very desirable that some experimental work should be done on it in this country.

In large-scale growing under light, the plants are stood in their pots, on benches in a hothouse, and mercury vapour lamps—expensive to buy and instal but cheap to run—or incandescent lamps—cheaper to buy and easy to instal, but expensive to run—

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are suspended above the plants on a properly built scaffolding or some other system, about three or four feet from the plants. For fast forcing it is apparently necessary to use 500 *lux* per yard; for slower forcing, a much lower figure should be of use. It is all rather academic, without being at all precise, and we shall know more about it when our own results with the remontants have been thoroughly tested and confirmed, and our methods varied until we have found out the limits. The principal fact which has emerged is that the period of irradiation must be prolonged; that low-intensity light for many hours is more effective than high-intensity light for fewer hours; that the plants must have *some* hours of darkness; and that the composition of the light is of no importance whatsoever to apparent results, although, of course, we have no idea what the unseen effect of the want of ultra-violet, for example, may have on plants and fruit.

X

THE PROPAGATION OF STRAWBERRY PLANTS

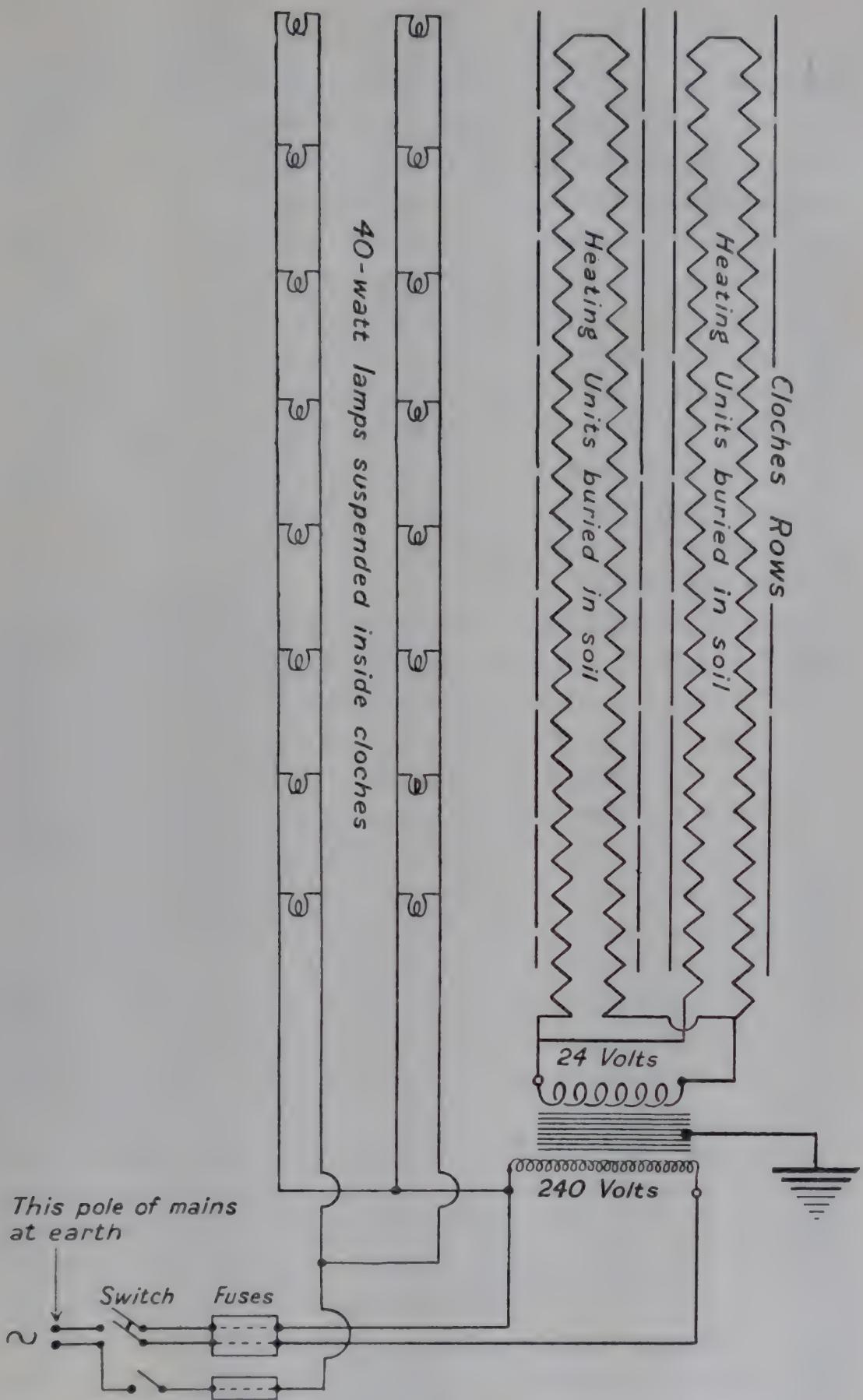
The ordinary varieties of summer strawberry plants are not propagated from seed, excepting by plant breeders, because, as gardeners say, they do not 'come true'. The reason for this is that they are all complex hybrids, not all the characters of which are fixed, genetically, which does not matter in the least while vegetative propagation is resorted to. Such attributes as size of fruit, colour, flavour, disease resistance and so forth are genetical characters, each governed by one or more genes. They may be what are called Mendelian dominants or Mendelian recessives. Seed resulting from self-pollination will not all have the same characters—'selfing', as it is called, will fix some but lose others, and in any case the seedlings will be very diverse. Where crossing, that is fertilization of the flower of one variety by another, has occurred then recessive characters, and perhaps very desirable ones, will probably vanish entirely and not appear in the seedlings. It is *possible*, of course, to obtain from casual crossing of two varieties a new seedling superior in important characters to both parents—for example, having larger fruit than either parent.¹ But it is so improbable as to be of no practical interest. Controlled crossing is quite another matter, but it is not the subject of this chapter.

In order to reproduce exactly in new plants the attributes of an old one, vegetative propagation is resorted to as the only

¹ In genetical language, this can only happen, as far as I know, where the varieties crossed are heterozygous for the character in question, and the latter polymerious.



From the American collection of the Coronet Plantations, Paignton: *Red Rich*, 21st October 1952. Some leaves removed to show fruit



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of the work of distributing pollen will be done by a draft from the ventilators on warm days, but to be sure of setting fruit hand fertilization must be carried out. A small water-colour brush or a rabbit's tail is used. The brush is rubbed gently on to the stamens so that some pollen adheres to it, and this is gently transferred to the pistil of another flower. If these are ready for pollen they will be covered with viscous fluid to which the pollen sticks, whereupon fertilization takes place. This work should be done at noon, preferably on a sunny day, and with the temperature boosted to 75° F. The flowers should be dry. If the work is carelessly done, deformed fruit will be the result.

As soon as the flowers begin to fade and fruit to swell, the temperature of the house by day should be kept above 68° F. and up to 60° F. by night. Watering should begin again, and occasional light syringeing. At no time must soil or plants be drenched. Once a week, manure water can take the place of plain water. Fruit trusses should be propped up on stiff wires stuck into the soil, so as to be exposed to light and air. Ventilation should be increased whenever weather permits this, for plenty of air will improve the flavour and the colour of the fruit. Imperfect fruits and unfertilized flowers should be pinched off.

Within the limits already stated, the date at which ripe fruit may be expected depends upon two factors : the amount of light the season has afforded ; the variety grown. The figures already given were for *Deutsche Evert*, and a good many days can be knocked off them. For such *hâtif* varieties as *Hâtif de Caen*, *Surprise des Halles* and, probably, *Cambridge 173*, and in a favourable season, it may be possible to get ripe fruit after only seventy-five days ; that is, there should be ripe fruit from about March 1st. An extra ten days must be allowed for mid-season varieties. From the first to the last ripe berry on all plants of a single variety about twenty days will elapse. With these figures available, the date of picking from March 1st until the time for picking the cloched crop starts, depends simply on the date at which forcing is started, bearing in mind the contraction of the start-to-finish time as the year ages.

To obtain a considerable crop by these methods, a large num-

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ber of plants must be grown. The skilful French grower reckons to get twelve fruits of selected size from his very best plants, only eight from most of them.

METHOD TWO. FORCING WITH ARTIFICIAL LIGHT

In this case, instead of faking dormancy conditions to create a false dormancy, we prevent the plant from sleeping at all; but it must in that case be older. The plants chosen should be maidens planted the previous autumn, de-blossomed in the spring, and then grown on in large pots throughout the summer, with the usual care and attention such as de-runnering. Such plants will be in a condition to bear fruit without a further dormancy, as they will have undergone one already and not yet carried a crop. In their case, what we are going to do is to bring forward the spring without a preparatory winter.

The principal advantages of using artificial light, as well as heat, are independence of winter weather—it no longer matters if the sky is overcast and there is no sunshine; a higher proportion of fertile plants and the reduction of the time elapsing between the beginning of forcing and the gathering of fruit by as much as one month. The expense is, of course, increased but, possibly, in commerce and on a large scale the larger crop due to fewer barren plants and deformed flowers may balance this out. In that case, lighting in the hothouse will be worth while. It is a matter for controlled experiment.

In experimental work, it was found necessary, by using light of low intensity, first to prevent the plants required to bear fruit in January from becoming dormant. This was because once the plant has become dormant it is extremely difficult to wake it up, and takes a very long time, as is apparent when forcing is being done without light. It requires far less light to keep the plants awake than it does to wake them up once they have fallen asleep.

Dr. J. W. M. Roodenburg, working at the Wageningen Horticultural Laboratory, found that ordinary incandescent electric lights at the rate of about 40 watts per square yard of plantation

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surface to be irradiated, and used from October 1st for seven hours a night, were adequate. The plants in this experiment were *Deutsche Evern* and the actual light intensity is given in Dr. Roodenburg's paper on the subject as 20 *lux*. But this low intensity lighting served only to keep the plants from becoming dormant, and in order to force the formation and ripening of fruit at a rate significantly greater than would have been the case without light, a much greater intensity was found necessary. From some time in November—say the middle of the month—the intensity of light was increased to 500 *lux* per yard, apparently given by the neon-tube equivalent of about 1 kva incandescent for six to eight hours a night. Neon tube was used for two reasons: the red component of light seems to be important; and neon tube is far cheaper to drive than incandescent lights.

In Dr. Roodenburg's experiment it was required to ripen fruit in January, and even December. In the case of later ripening, say March and April, light of lower intensity would give some advantage. In the latest experiments, mercury vapour tubes are being used, for it has been found that the *quality*, the composition of light is of little significance, all that matters, in getting ripe fruit, is the intensity and duration of light. Moreover, you cannot make up for short duration by increased intensity. For example, if you find that you get good results by irradiating your plants at the rate of 100 watts per plant for six hours a night, you will *not* get the same result if you double the wattage and halve the period. There is an optimum rate at which plants can make use of light, and beyond this point greater intensity is of no use at all, but is wasted. Time is the important factor, once the intensity has been raised to such a figure that the plant is getting all the light it can use. Just what this figure may be has not yet been established by experiment, as far as I know, and it is very desirable that some experimental work should be done on it in this country.

In large-scale growing under light, the plants are stood in their pots, on benches in a hothouse, and mercury vapour lamps—expensive to buy and instal but cheap to run—or incandescent lamps—cheaper to buy and easy to instal, but expensive to run—

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are suspended above the plants on a properly built scaffolding or some other system, about three or four feet from the plants. For fast forcing it is apparently necessary to use 500 *lux* per yard; for slower forcing, a much lower figure should be of use. It is all rather academic, without being at all precise, and we shall know more about it when our own results with the remontants have been thoroughly tested and confirmed, and our methods varied until we have found out the limits. The principal fact which has emerged is that the period of irradiation must be prolonged; that low-intensity light for many hours is more effective than high-intensity light for fewer hours; that the plants must have *some* hours of darkness; and that the composition of the light is of no importance whatsoever to apparent results, although, of course, we have no idea what the unseen effect of the want of ultra-violet, for example, may have on plants and fruit.

X

THE PROPAGATION OF STRAWBERRY PLANTS

The ordinary varieties of summer strawberry plants are not propagated from seed, excepting by plant breeders, because, as gardeners say, they do not 'come true'. The reason for this is that they are all complex hybrids, not all the characters of which are fixed, genetically, which does not matter in the least while vegetative propagation is resorted to. Such attributes as size of fruit, colour, flavour, disease resistance and so forth are genetical characters, each governed by one or more genes. They may be what are called Mendelian dominants or Mendelian recessives. Seed resulting from self-pollination will not all have the same characters—'selfing', as it is called, will fix some but lose others, and in any case the seedlings will be very diverse. Where crossing, that is fertilization of the flower of one variety by another, has occurred then recessive characters, and perhaps very desirable ones, will probably vanish entirely and not appear in the seedlings. It is *possible*, of course, to obtain from casual crossing of two varieties a new seedling superior in important characters to both parents—for example, having larger fruit than either parent.¹ But it is so improbable as to be of no practical interest. Controlled crossing is quite another matter, but it is not the subject of this chapter.

In order to reproduce exactly in new plants the attributes of an old one, vegetative propagation is resorted to as the only

¹ In genetical language, this can only happen, as far as I know, where the varieties crossed are heterozygous for the character in question, and the latter polymerous.

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method when we are dealing, as in the case of strawberry plants, with complex hybrids. There are various methods, but all have the same principle : a piece of the living plant, root, stem, leaf, is planted, makes a new root and new vegetation. Or the piece may be grafted on to a compatible root; or it may be planted in the soil before being severed from the parent plant, as in layering.

In the case of strawberries the business is particularly easy, because, of course, the plants throw out runners along which form a number of new plants, complete with crown, leaves and embryo roots which, in contact with the soil, grow into adult roots. Or, in the case of varieties where no runners are formed, new crowns with their own vegetation and roots, form in circles about an old crown. In the case of the summer strawberries, all varieties make runners.

All the individual plants of a variety which has been created by vegetative propagation from a single seedling are, in a real sense, parts of one huge, single plant: such a group is called a *clone*. There are people who maintain that the tissues of the plants of any clone are as old as those of the parent seedling of the whole clone, and that this explains the degeneracy of old varieties. It is, they say, senility. The small, individual strawberry plant, just rooted, may be young when considered as itself; but its fundamental cells are not, they are as old as the parent of the clone. In the case of *Royal Sovereign*, e.g. about a century. The argument, while there is evidence in its favour, does not seem to be very clear. It seems to confuse genotype and phenotype, as geneticists say. On the other hand, growth does occur by cell division, and if the original cells of a plant have developed, with age, some fault, which we may call senility, without knowing exactly what this entails, then presumably all the cells might be called senile. Very little seems to be known concerning the longevity of perennial plants. In certain conditions they may be immortal. But plants certainly *do* die of old age; and clones *do* wear out.

Although all the members of a clone are considered identical *in potentia* selection among them of strikingly superior individuals, and propagation only from these, produces new and

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better *strains*; these are sometimes also confusingly called clones which, in fact, they are. Such strains within a variety differ demonstrably and by definition from the varietal norm, in being superior, perhaps in vigour, in fruit size, in flavour. In that case, what becomes of the contention that vegetative propagation reproduces the parent attributes without change? In the first place, when the attributes of a variety are described, then that description evokes, can only evoke, a sort of average, a norm. And if, by selection, only the best plants are propagated, then in the new strain the norm is superior; but nothing new has, in fact, been created. What is very much more confusing is the selection of superior individuals within a variety of plants propagated by seed. According to Western genetics, as far as I can see, it does not matter in the very least whether one chooses seed from a large or small, good or bad individual of a variety. Its genes will be quite unaltered by the manifest physical attributes of the plant from which it comes. Western geneticists say that while the manifest morphology of a plant can be altered by its environment, so that, of a thousand siblings, one may be superior in several characters to all the rest, this superiority *does not indicate any genetical change*. The manifest attributes of a variety, composing what they call the *phenotype*, can be modified by feeding and other external influences; but the *genetical attributes* composing what they call the *genotype*, remain unchanged. Therefore the superior individual of a clone cannot pass on its superiority to its offspring by way of the seed. On the other hand, the school of genetics which has become associated with the name of Lysenko, but of which one finds unwitting scholars among many American and other botanists, say that modification of the phenotype can and does lead to modification of the genotype. As far as I can discover, practical plant breeders who do not know any genetics and manage very well without it, are all Lysenkists without ever having heard of that gentleman. My own notion is that Western genetical ideas are the modern version of religious determinism, and just as suspect on political grounds as those of the Russian botanist!

At all events, by propagating strawberry plants by means of

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runners, the pitfalls of genetics are avoided, and the attributes of the parent plant exactly reproduced, and by selection of the best parent plants improved strains are constantly being established.

The strawberry grower who is going to have his own nursery beds must equip himself to recognize the early symptoms of virus debility, for which purpose he is referred to Chapter XI. Secondly he must not propagate in close proximity varieties which are virus tolerant, with those which are not. This is also discussed in Chapter XI.

The nursery bed should be deep dug on heavy soil, shallow dug on light soil, and in both cases richly manured. Where deep mulching with compost is possible and on light or medium soil, digging can be omitted entirely. But it is important that any perennial weeds be removed.

Perfectly healthy maiden plants of the variety to be propagated should be planted a yard apart in rows a yard apart in September. They should be watered in if the soil is dry, and thereafter well hoed to a shallow tilth.

From the beginning of the following April a watch is kept on the plants and those which produce no flower bracts dug up and thrown away. Very few plants are barren, but they do occur occasionally and the barrenness is passed to the cadets. The entire flower bracts on all plants must be removed as fast as they appear. This de-blossoming should be maintained throughout April and May.

Runners begin to develop as soon as the flowers. They may grow to a great length, with as many as twenty little plants on the straight run, as well as many more on the branch runners. Some experienced growers, among them many of weighty opinion, believe that the later runner-plants, the 'tip' runners as they are called, are weak and inferior plants, and they will not use them. Scientific opinion is against them; at East Malling no difference in the subsequent size and performance between the first and last runner plants has been observed. My own experience is that a tip runner is as good as any other, only that, being smaller when planted, it may not be quite so large, quite so soon. Other growers, and among them Major Douglas Corner, whose

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experience is vast, hold that the taking of an excessive number of runner plants from parent plants—often well over a hundred cadets per plant and as many as 500 in some cases—is responsible for the debility of certain varieties ; had, in fact, exhausted these varieties. It may be so. At all events, since the grower whose nursery is only for the provision of his own fruiting beds does not need enormous numbers of plants, he need not allow each parent to bear all the runners it can. The commercial strawberry propagator has to meet very heavy labour costs, for the setting, pegging, disinfection, spraying, grading, washing and packing of young plants is all manual labour and must be done within a short season, so that very numerous hands are necessary. Moreover, to get a certificate of health for the plants, he has to allow Ministry of Agriculture inspectors, persons of austere life and incorruptible character, to go over his land at intervals, and rogue all plants suspected of being disordered by virus, which they do with a kind of grim devotion to an ideal of perfect health which is perfectly ruthless. Even so, he may get 100,000 young plants from an acre, which at £5 10s. a thousand, is good business. His customer, after all, will be doing extremely well if he takes twelve tons of fruit from an acre of plants before they have to be replaced, and very lucky if he gets £100 a ton for his fruit.

The home-grower should watch the runners as they develop, spread them out round the parent, and, at the point where the cadet crowns appear, secure the runner to the surface of the soil by putting a stone on it where the soil is light, a lump of earth where it is heavy. Set, in this manner, not more than four or five cadets per runner, on not more than ten runners arranged like the spokes of a cartwheel about the parent. Then stop the runners and pick off any new ones which form, for a return of thirty or forty young plants per parent is quite enough, and the plants will be larger and more mature if thus limited. It will also be necessary to make a weekly inspection of the nursery to remove the runners which will start from each of the cadets.

There is no need to cut the runners until the plants are re-

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quired. Leave the whole system growing as a unit, weed it by hand, and water during droughts.

At frequent intervals throughout the season the nursery must be inspected for symptoms of virus disease, where the variety being grown is a symptom-shower, such as *Royal Sovereign* or *Hercule*. Disordered plants must be removed at once. The nursery beds may be sprayed against aphis (see Chapter XI).

When the time comes to plant, cut the runners as near to each plant as possible. Dig up the parent plant and throw it on the compost heap. Dig up the young plants with the soil still adhering to their roots and transplant them to the fruiting beds so quickly that they have no time to dry out or wilt. As you come to any particularly fine young plant, put it on one side, heeled in, and when the transplanting is done, make up and manure the nursery bed again and, using these fine specimens, start the next season's nursery bed at once. For the rest of the season rogue this new nursery for virus, cultivate it, remove runners, and so keep it ready for next season, when the whole of the above process is repeated.

In the case of *Auchincruive Climax* and other two-crop varieties, such as *Victoire*, a variation on the above method is permissible. These varieties, de-blossomed in spring, bear particularly well in autumn. With these varieties, do not dig up the parent plant in the nursery. Cut away and dig up the cadets, and leave the parent standing. It will probably flower in August and bear a crop in September/October.

Another Method

The method described above is that recommended by authorities for the maintenance of health and vigour. I have practised it and have studied the practice in a very large strawberry nursery, and recommend it for the large garden or the market-garden. But where the amateur requires rather a few plants for a small plantation, and wishes to replant frequently, which is desirable and often necessary, a less laborious method is possible, and works well.

The fact is that the authorities insist upon a high and firmly

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maintained standard in order to be as sure as possible of good results; but, after all, strawberries are for men, not men for strawberries.

By the easier method no special nursery is maintained. The runner plants are taken from the fruiting plants. When the fruiting plants come into flower, supposing that they have been planted and cared for as I have suggested, they are at the height of their vigour, and quite capable of yielding a few cadets as well as a crop of fruit. In May, prepare a loose and spongy compost of one-half mature Howard compost, sifted through a quarter-inch mesh, and one-half leafmould from a wood of deciduous trees. To a barrow load of this mixture, add one pound of dried blood, a pound of hoof and horn *flour* (not the coarser meal), two pounds of steamed bonemeal and three or four handfuls of fine, fresh wood ashes. This is a 'strong' compost, but we are after quick growth: the compost must be very thoroughly mixed, and this can best be done with the hands. Then moisten it with warm water through a fine sprinkler until it is lightly saturated, like a squeezed sponge. It must be thoroughly damp, but not sodden. Fill as many three-inch pots with this material as you will require young plants; or, if you have the gear, make the requisite number of soil pots.

Almost as soon as they flower strawberry plants begin to throw runners, which are normally removed. In this case leave one to each plant, barring any plant with virus symptoms. Line up the pots near to the flowering plants, bedded well down in the straw, and peg into each pot the first cadet plant to form on each runner, pinching off the runner just beyond the infant plant.

Within a couple of weeks, or less if the weather is warm, and in any case before mid-June, and provided the pots are watered with regularity, and other runners pinched off, the young plants will be well-rooted—in fact the pots will be crammed with roots coming through the drainage holes in the bottoms.

The young plants can be set out at once in the next year's beds, being knocked out of the pots, soil ball intact, so that they are not disturbed. The whole operation will be over by the first week in July, with the result that, with the usual routine care,

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they will make, by their own fruiting time nearly a year later, as fine a row of maiden plants as you have ever seen. And it is absurd to suppose that taking a single cadet from each of your fruiting plants will have any adverse effect whatsoever on them.

Alpine Strawberries: Propagation from Seed

The propagation of Alpine strawberries should be from seed. In the case of runner-making varieties, such as *La Brillante*, runner cadets can be used; and in the case of the runnerless varieties, crown division is perfectly possible. But in both cases seed propagation is so easy, and produces such vigorous plants, that since it assures you virus-free plants, it is by far the best method. (Virus is never present in the seed, and infected plants do not, therefore, pass the trouble to their seedlings.)

As the Alpine varieties are either species improved by selection, or simple, stable hybrids, they come true from seed, of course.

There are two methods of growing strawberry plants from seed: the first is correct and advisable. The second, my own, is labour-saving, but it occasionally results in failure in the end. I shall describe both methods.

Correct Method

Watch for and mark the largest, healthiest and most fruitful plants in the Alpine strawberry beds or borders. Why you should do this, I cannot say, for since Western genetics maintain that individual deviations from the clonal norm due to local conditions cannot affect the genotype, why bother about the quality of the parent plant? The fact is that traditional plant breeding, based upon empirical methods, has improved plants out of all comparison with the primitive progenitors, and we had better stick to it until genetical-politics become too much for us. However, there is another reason for choosing fine parent plants: such plants *may* possibly be mutations—it's excessively unlikely but it does happen, and in that case it is obviously desirable to propagate from them.

Take from the selected plants the finest ripe berries in the



German collection,
Coronet Plantations,
Paignton: *Ada Hertzberg*, 21st October
1952. Plant in fruit
since July 28th. Leaves
removed to show fruit



St. Claude. October. In
the author's garden



Photographed 24 December 1952. In front: *Aurora*, early summer variety, brought into heat 20 November. Left: *Red Rich*. Right: *La Sans Rivale*. Back: *La Sans Rivale* but de-blossomed until October instead of September
Coronet Plantations, Paignton



La Sans Rivale in the author's garden—October 20th

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height of their fruiting season. Do not pick the fruit until it is over-ripe—wine-dark in the case of red berries, amber in the case of white. Place the fruit on a sheet of blotting paper, squash them, and leave the mess to dry.

The edible part of a strawberry plant is not a true fruit, for the seeds are carried in pits over the surface of the berry, and they are the true fruit. They are small but, of course, visible as minute needle-shaped bodies, yellow or brown in colour. As soon as the squashed mess is dry, tease the seeds away from the dried pulp with the point of a darning needle, brush them into an envelope, and put them away in a drawer until the spring, marked with their name, of course.

Another method of getting the seeds free from the berries is to put the berries into the bottom of a deep jug or jam-jar, and run the tap on them at full pressure, shaking the jug all the time. Remove the berries with a spoon, and then pour the water through a filter paper set in a funnel. Gently lift out the sodden filter paper and spread it out to dry. Thereafter shake the dry seeds trapped on it into an envelope; but be sure that they *are* dry.

The seeds may either be raised in autumn and the seedlings wintered in a frame to be planted out in March; or they can be sewn in March and planted out in May. In either case, sow them in boxes filled with J.I. Compost No. 1. The seeds being very small should be only very lightly covered, but pressed firm into the soil, and shaded until after germination, so that watering is not necessary before germination or when the seedlings are tiny. Major Corner believes that there is advantage in planting the seeds late in October and leaving the boxes out all winter, to be frozen, in which case germination, in the spring, will be better.

As soon as the seedlings have two true leaves, that is leaves with clearly visible serrations, and are big enough to handle, they can be pricked out into frames or under cloches. Incidentally, the number of teeth composing the serrations of the edge of a strawberry leaf, are an indication of the plant's age and state of maturity or otherwise. The seedling leaves have five teeth. Fewer than fifty teeth indicates immaturity; such a plant

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is not ready to bear fruit. Teeth in excess of seventy indicate senility; such a plant has passed its zenith.

About six weeks from pricking out, the seedlings, with the soil-ball about the roots intact, can be planted out into their stations. In suitable soil and fair weather they will begin to flower in August of their first year, or sooner, producing relatively very large fruits. In their second year the fruit will be borne from June to October, and the total crop will be larger, but the individual berries not so fine.

The Labour-Saving Method

Pick the berries of the largest size from the best plants, and only when they are over-ripe, in September. Prepare a shallow box of moist compost and make a very firm surface by pressing it hard with a sheet of glass. Squash the very ripe strawberries on to the soil surface, and then spread the mess about with the fingers. Then cover with moist compost, shade, and place the box under a cloche with an open ventilator. Remove the shade after germination (ten days), but continue to grow the seedlings on under the cloche, watering as necessary. Prick out the seedlings under another cloche or cloches. As soon as the little plants are large enough not to be lost under a crumb of soil or swamped by even a moderate rain, remove the cloches. Thereafter let them take their chance until planting out time in March. The survivors will be hardy and strong.

Germination by this latter method is extraordinarily high, probably due to the freshness of the seed.

Propagation of Perpetual Strawberries or Remontants

Most, but not all, remontant varieties make runners, but certain varieties make too few for adequate propagation. Propagation by seed, however, will not do, for the same reason as in the case of ordinary strawberry varieties.

Some remontant varieties which make ample runners in their first year, make very few in their second; in other cases this habit is reversed. Some varieties, for example, *Charles (Géant) Simmen*, hardly ever make more than one runner per plant, or

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not even so many: others, like *Red Rich*, are so copious in this respect that they are a nuisance.

Where runner cadets are sufficient, propagation is by their means: where they are not, propagation is by crown division.

Propagation by runners

In principle the method is the same as that described for ordinary strawberry varieties, but there are two important differences.

In the first place, the runner cadets of many remontant varieties, e.g. *La Sans Rivale*, *Triomphe*, *Kuntner's Triumph*, and many others, flower as fast as they form, and may be depended upon for a great part of the crop. This singularity distinguishes the varieties clearly from both ordinary and Alpine strawberries, and suggests some important physiological difference which would be well worth investigating. For a cadet of an ordinary strawberry variety is incapable of producing fruit bracts until it is mature. Physiologically, the cadets of remontant varieties, at least during the summer and early autumn, seem to partake of the maturity of the parent plant.

From the point of view of the plant propagator this habit is a nuisance; it would entail the constant deblossoming of cadets during four months, if it were not the case that the early cadets of remontants are not the ones which the propagator should use. For the older a remontant plant grows, the less prone it is to be reliable as a remontant and the smaller the fruits become: if young plants produced early in the season are used to plant up new beds, they will, in fact, really be in their *second* season when they reach full size the following year; they will have been too mature at the time of planting; even if they are carefully deblossomed throughout their first season, still they will have reached such a stage of maturity that some part of that attribute which makes them remontant will have been, as it were, wasted. I am aware that this explanation is very imperfect and even obscure, but the physiology of these plants is not understood, and one can write only from observation, not from knowledge. The fact, then, is the earliest and largest cadets, the very ones which the grower would choose in the case of ordinary straw-

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berry varieties, should be rejected in the case of remontant varieties, and the latest and smallest cadets chosen in their stead.

These very small and rather miserable-looking tip runners are, apparently, juvenile, not mature. At all events, they do not flower, and are therefore true maidens when planted out. It should be said that I *have* used earlier cadets and larger ones, and even cadets which have flowered and fruited, and have still had good results. But not, perhaps, as good as the results obtained with maiden plants; moreover, the experience of hundreds of French growers is against me.

Plant the varieties to be propagated in a nursery bed, giving them plenty of room. Pinch out the flower bracts as fast as they form, throughout the spring, summer and early autumn. Also pinch out the runners until September. Cultivate the soil round the plants to a fine tilth about three inches deep. During September allow the runners to grow and hold them down to the soil with lumps of earth or with stones. Continue deblossoming both parent and cadets. Half-way through October cut the runners, choose among the cadets the plants which have not flowered, or tried to flower, that is the youngest, and plant them out to make the new bed. Do not be concerned at their small size: this is as it should be, and however tiny they may be in October, by the following August, with proper care and soil, they will be enormous.

Crown division

Varieties which make few or no runners are planted out in a nursery bed in the same way, and deblossomed throughout the growing season (April to October). The plants should be encouraged to make as many young crowns as possible, about the parent crown, by cultivation and manuring and watering when necessary.

In mid-October dig up each plant, now very large, and thoroughly wash and clean the roots so that you can see what you are doing. It will then be apparent that about the central, old crown have formed rings of new ones. Take only those small, outside crowns which, although they have ample root, have not

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tried to flower. It is not usually necessary to cut them away from the parent group; a fairly hard tearing movement with the fingers will do the work, although sometimes the crown and foliage come away leaving the roots still attached to the progenitor.

As in the case of ordinary strawberry varieties, the grower who wants only a few young plants every year, to renew an amateur garden bed, can use the other method, that of taking his cadets from fruiting plants. It is true that in the case of the summer varieties the cadets can be taken when the plant is still in full vigour, whereas, since we have to take the cadets of remontants late in the year, this is not possible with these varieties. But this is of no importance, for instead of wanting the largest and strongest cadets, we want the smallest and least mature. However, plants from which runners as well as fruit are to be taken should be controlled and not allowed to exhaust themselves by free bearing. Take from each only a modicum of fruit and a very few runners, or young crowns.

A final note: it is essential in propagating remontants, or any other variety of strawberry plant, that no cadets be taken from plants with symptoms of debility, and that such plants be dug up and destroyed. Furthermore, in the nursery especially, to minimize the danger of virus disease spreading, all plants should be regularly and carefully inspected for *aphis*, the vector or carrier of the virus, and/or regularly sprayed with insecticides (see Chapter XI).

XI

DISEASES, PESTS, AND THEIR CONTROL

VIRUS

The most serious trouble which afflicts strawberry plants is the complex of rather mysterious symptoms known as virus disease. This is very grave in the case of strawberries plants than of any other fruit plants, and it is worth while to consider it at some length.

The term virus is rather loose. When bacteriologists, in the eighteenth and nineteenth centuries, discovered the teeming sub-visible world of the microbes, great steps forward were taken in the understanding and control of certain diseases. Bacterial maladies were identified, and it was discovered that the blood of living animals or men possess protective power. For it was found that cultures of bacteria when injected into men or animals provoked their blood to create antibodies, thus protecting them against the disease in question. A splendid series of successful researches created a confident state of mind, and there was some hope that the problem of preventing and curing disease was nearly solved.

One of the first serious checks to this progress occurred when, in the case of certain diseases which appeared to be bacteriological, no bacteria could be discovered even with the most powerful microscopes. The nature and progress of these diseases nevertheless implied the existence of causative organisms, the presence of which was thus assumed. One of the techniques used for removing bacteria was that of filtering the fluid in which they

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were presumed or seen to be, through porcelain filters under great pressures, the fluid passing the filter, the bacteria, small though they were, being held back by it. Thus, the material at the entry end of a filter would be active, that at the exit end passive and harmless.

In the case of those diseases of bacterial character but in association with which no bacteria had been isolated or even seen, it was found, however, that filtered material was still active, i.e. injected into a man or animal, it would cause the characteristic disease. It was at first supposed that this fluid had acquired its active properties from the organism; such fluids were known as *virus*, the Latin word for poison. Subsequently it was shown that, in fact, the organism was still present in the fluid, but the name of 'poison' stuck, and the bodies in question became known as *filter-passing viruses*. These organisms have, in our own time, been actually 'seen', by means of the electron microscope: the difficulty of seeing them with an optical microscope is that many varieties of the bodies are smaller than the wavelength of visible light even at the short end of the spectrum.

The first virus actually to be isolated was not one causing animal or human disease, but that of tobacco-mosaic. Or rather, it was demonstrated (in 1898) that the filtrable body in the fluid from a mosaic-sick plant, could cause the symptoms of mosaic in a healthy plant. As a matter of fact the crystallization of the virus had been done some years earlier, but the significance of the discoveries then made was missed. As to whether plant and animal viruses are 'alive' or not, it probably depends upon what you mean by 'alive'. At one time there was a tendency to make a distinction between animal viruses, which were considered to be organisms, and plant viruses, which were thought to be inert 'chemicals', complex molecules with a good deal in common with protein molecules. Injected in solution into a plant, however, they behave rather as if they are alive, in that they increase and multiply at the expense of certain parts of the plant into which they penetrate. They attack and destroy protein molecules and thereby increase themselves. It is presumably this consumption of parts of the plant by a substance which has itself

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entered into the cells of the plant, which causes those symptoms of debility, various and diverse, and which are known as 'virus disease'. Thus it seems that physically we know what plant viruses are. But philosophically, as it were, they are a mystery, and this fact should always be borne in mind when considering phenomena connected with them. Otherwise, as I shall hope to show, one is easily led into logical absurdities.

Associated with all species of *Fragaria* there are (at least) five and possibly more kinds of viruses, known by numbers, as Virus 1, Virus 2, etc. They are identified by the symptoms they cause. In some varieties only is the presence of the viruses productive of immediately manifest symptoms of debility. In other varieties there are no immediate manifest symptoms. And in others again there may, perhaps, never be any symptoms at all. Strawberry varieties are now classified by their behaviour when 'infected with' virus; they may be susceptible of showing symptoms; or they may be symptomless carriers, that is, like certain human beings who are tolerant of certain bacterial diseases, they can carry the virus and infect other plants with it, but do not themselves become debilitated by it, or not, at least, for a considerable time.

It is usually the case that the disorder of a susceptible plant caused by the presence of one kind of virus only, is not grave. There are visible symptoms but they are of no importance excepting as warnings. For, if a second, or a third, or more viruses enter the body of the plant, then they form a complex, the symptoms of debility associated with which are worse than and different from a mere combination of the individual characteristic symptoms of the different individual viruses.

It is very natural, but perhaps not very scientific, that we, as parties interested economically in certain plants, should consider the plant viruses simply as disease organisms, just as we tend to think of all pathogens from our point of view, and rarely from theirs, as it were. This may sometimes lead to such concentration upon the idea of getting rid of disease by eliminating or checking the causative organism or particle that the other possibility, of studying, and reinforcing by whatever

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means, the tolerances, resistances and even immunities to be found in host plants, animals and men, has perhaps been given too little attention. We will come back to that later. One point which has become clear in the last few years and which should be made is that virus disease is more widespread than is generally recognized, and that the reason for the failure of recognition may often be a lack of any standard of comparison. Fruit plants, if really 'well done' by the grower, may bear what seems to be quite good crops of quite good fruit, and thus pass as healthy *because*, perhaps, the grower has *never seen a virus-free plant of that variety*. I am certain that this is true of strawberries. In another part of this book I refer to Dr. Vercier's opinion of the value of rich organic manuring in combating virus disease. It is only fair to add, in *this* part, that the plants he observed would probably have been strikingly better still had they been free from virus.

It is believed that strawberry virus cannot be transmitted by way of the seed, so that all seedlings are free from it until infected by an adult plant. Only one natural means of transmission of virus from infected to uninfected strawberry plants is known and established, and that is in the body fluids of certain aphides, and principally of *Capitophorus fragariae* Theo., whose portrait appears below. This is the strawberry aphis.

SYMPTOMS OF VIRUS 'DISEASE'

It is not necessary in this non-professional and non-technical account to go into the difficult and skilful business of identifying each virus by its characteristic symptoms. Here are the three principal 'diseases' caused by virus, in terms of manifest symptoms.

1. *Yellow Edge*

The young leaves rising from the centre or crown of the plant are subnormal in size, dwarfed, and have a yellow edge, as the name of the disease implies. This edge is not an even margin, but of varying width, and shaded off into the green. The plants

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remain dwarfish and miserable-looking. No chlorophyll is present in the margins of the leaves, and no growth takes place at that point, and the leaves therefore grow cup-shaped. The whole plant looks flattened, excepting for the old leaves which may be normal, and will therefore be several sizes larger and four or five times as tall as the new ones.

2. *Mild Crinkle*

Instead of the leaf margins being chlorotic, chlorosis is distributed in small spots all over the leaves. The spots are yellow, and turn red. No growth occurs at these spots, but continues all about them, which results in warping of the leaves, or crinkle. If the symptoms get no worse than this, the plant may still be useful and can be retained, but it is difficult to distinguish the symptoms of mild crinkle from the beginning of severe crinkle.

3. *Severe Crinkle*

The chlorotic areas are larger, more numerous, die completely, turning brown and brittle. Leaf distortion is excessive and very ugly. The fruit is also misshapen, and fails to mature, much less ripen. It is possible to overlook a case of mild crinkle: the plant does not look so *very* different from a healthy one. But severe crinkle, once established, is unmistakable.

Plants may have all three diseases. Each of the three diseases is due not to one but to a given complex of viruses.

In addition to these identifiable cases of virus 'disease', it is not unusual to trace to virus trouble such symptoms as dwarfing, unaccompanied by crinkle or yellow edge, and many other disorders of the plant. Where they are not due to virus it is certain that plants can recover, at least as to appearance and performance, from all these conditions with the exception, perhaps, of severe crinkle. Many debilitated plants are so because they are planted in unwholesome soil, in badly drained soil, or in soil which dries out. Others suffer from root-rots. A general debility or degeneracy of strawberry plants is very common, so common that it is very rare to see perfectly healthy plants in private gardens, and many private gardeners

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have perhaps no idea of what perfectly healthy specimens of their variety really look like. Such degeneracy is probably due to several causes at once, including virus: but the bad effects of virus disease will not always be so immediately apparent and severe where conditions are excellent as where conditions are already such as to debilitate the plant.

WHAT IS A DISEASE ORGANISM: ARE VIRUSES DISEASE ORGANISMS?

Our boasted objectivity sometimes collapses when it comes to considering living organisms whose activities damage man or his property. The trained biologist may be objective, we are not, and think of, say, *pneumococcus*, as the causative microbe of pneumonia, and as nothing else. Whereby we reveal that we are being less objective than we imagine, however, for we are allowing an irrelevant and purely social consideration to warp our judgement. We rarely make this mistake when the organism afflicting humanity is larger: for example, the tigers which eat up a village full of Indians, are not thought of simply as disease organisms of Indians; it is realized that they have, as it were, a point of view, and are engaged in getting a living, like the rest of us. But the smaller creatures, such as bacteria, are never considered as having a point of view. I do not mean, of course, that they may be intelligent, but simply that, like the rest of us, they are driven to propagate their kind, and to do this, must survive and prosper. From the point of view of, say, an impartial creator, no organism could be thought of as a disease organism of some other. *Pneumococcus* could no more be thought of as a disease organism of man, than man could be thought of as a disease organism of oysters, although he does the creatures more harm than any other of their parasites.

It happens that some creatures are parasitic on others, but, in natural conditions, host and parasite populations tend to reach a balance. In cultivation, or civilization, however, the grouping of great populations of host plants or animals in one place, permits the parasites to prosper out of all proportion.

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A normally tolerable parasite therefore becomes a disease organism, because it is pernicious to the health of the host. Disease is a failure in balance, and to combat it the balance should be restored. It is far sounder to render the host resistant to the parasite, than to try and exterminate the parasite. That probably merely makes room for another.

The strawberry viruses are not, it seems, alive. But they do multiply in the plant and it would seem that they, like living creatures, have therefore, as it were, a point of view. There is simply no such thing as a disease organism as such ; we do not, in fact, know what the viruses are, nor what they are for, nor where they come from. Some strawberry viruses persist in the bodies of aphides, but do not apparently cause disorders of aphides : the reaction of the host plant to the parasite decides whether that parasite is to be considered as a cause of disease in that particular host or not. Most and perhaps ultimately all species and varieties of strawberry plants show virus symptoms if *deliberately* infected, but in natural, as opposed to cultivated, conditions, infection does not easily occur because the vector aphides do not readily find the nourishment they seek in plants growing under such conditions. Even susceptible cultivated varieties planted in woods and allowed to go wild, as it were, do not often suffer infection. But what of the varieties which are tolerant? Susceptible varieties are always troublesome. Why bother with such a plant, or such a variety? There are plenty of others. It may be that the debilitated variety is a particularly good one. *Royal Sovereign* strawberry is a case in point, and *Hercule* is another. Heaven knows what money and time and talent have been spent on propping up *Royal Sovereign*. And the result, from the purely scientific point of view, has been a triumph. Anyone who has seen the perfectly healthy *Royal Sovereign* clones produced by East Malling Research Station must be full of admiration for the pomologists, phytopathologists, Ministry of Agriculture inspectors, and others who have helped to make them possible. But as even the best of them go down at once if they are infected with virus by the aphides, the work in question is rather academic. Would it not, perhaps, have been

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better, to give up *Royal Sovereign* as a bad job and set about breeding new varieties with resistance to virus, and all the good qualities of *Royal Sovereign*, or even of better varieties, into the bargain? There was no need to fear failure: the number of good new varieties which are put into commerce *every year* in France, for example, is great: and many of them are of the finest quality. Our plant breeders are too timid; and not sufficiently numerous.

Not only is the breeding of new varieties a positive method of combating virus disease in so far as although the favoured novelties would be the tolerant ones, and therefore the difficulty of dealing directly with the virus would be increased, yet with a constant flow of new tolerant varieties the economic consequences of virus would be less important, but it might also be that if we were growing not a few but hundreds of different varieties of every fruit-plant, it would be far more difficult for any pest or disease organism, whether virus, bacteria or insect or fungus, to attain the devastating strength which some have attained. When I was doing two years' reading in preparation for the writing of a book on the connection between soils and the civilizations living upon them,¹ I came to the conclusion that the safest and most stable kind of culture is that which, in important respects, imitates a natural 'soil community'. Parasitic creatures are kept in check in nature by the difficulty of finding their hosts: because of that difficulty their numbers rarely become such that they are able to dominate. But in cultivation the pest will find its host plant, or animal, or even man, gathered together for its convenience in one place, and kept in highly nutrified condition. The parasite, naturally, is able to increase out of all measure. Thus, pests and diseases become most dangerous where men insist upon establishing large-scale monocultures. This consideration does not, it is true, directly affect the virus in question; but it may be relevant when we remember that the vector of virus is an aphid. If our fruit-plant varieties were far more numerous and no very great plantations of any single variety occurred anywhere, it would be far more difficult for pest and disease organisms to reach epidemic proportions.

¹ *Soil and Civilization*. Thames and Hudson. 1952.

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The concentration upon few varieties, of strawberries as of other fruit plants, is not the fault of the grower who does not particularly like the policy and would often like to be much freer to try new varieties. Nor would it be sufficient if there were more plant breeders, producing more new varieties. The conditions under which growers work are dictated by the market. Growers have to live and to do that they must sell what they grow, and to do that they must grow what the market will take. Food buying in, for example, France, is a matter of judgement and initiative on the part of the housewife. In Britain it is a matter of fashion, or of trouble-saving. The housewife knows that Cox's Orange is a good apple, or Sovereign a good strawberry, and she will have those and nothing else, although there may be apples which, in her region, are better than Cox, strawberries superior to Sovereign. What is the origin of this slavish state of mind? I think that it is the dominance of the market by the proprietary brand, the recognizable packet or carton. So powerful is this influence that growers are being forced to make the fresh and delicious products of their orchards and plantations look as much as possible like the old dead stuff, the plant carrion which we eat out of cans, by wrapping it, stamping it, labelling it. The housewife pays for this, of course. And what is it that she is paying for? The privilege of being told by someone else what she ought to like. And who is this pundit? A doctor? An expert of diet, or on cuisine or on domestic economy? By no means: he or she is an advertising agent, that is to say a person who lives by persuading others to spend money they have not got on something they don't want.

Thus it comes about, as I think I have demonstrated as clearly as it can be done, that the dangerous and expensive spread of food-plant pests is due to the operations of advertising agents! Perhaps this may not be a perfectly serious argument, seriously intended. But exaggeration is a form of satire, and satire is a way of drawing attention to abuses. And it is an abuse of reason, nature and common sense when an *industrial* state of mind is allowed to dominate and warp agriculture and horticulture.

It would be a good thing to have our gardens and farms full

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of virus-free plants, but is it possible? Unless every infected plant in the world can be got rid of, there will always be sources of infection. Or unless every vector insect can be exterminated, whole species wiped out with Heaven knows what secondary effects, viruses will be carried to virus-free plants. Possibly the scientists have in mind the gradual upgrading of plant populations, the steady increase in the numbers of healthy plants. Meanwhile, no doubt, they are not spending all their time on attacking the virus, but spending some of it in reinforcing the plants.

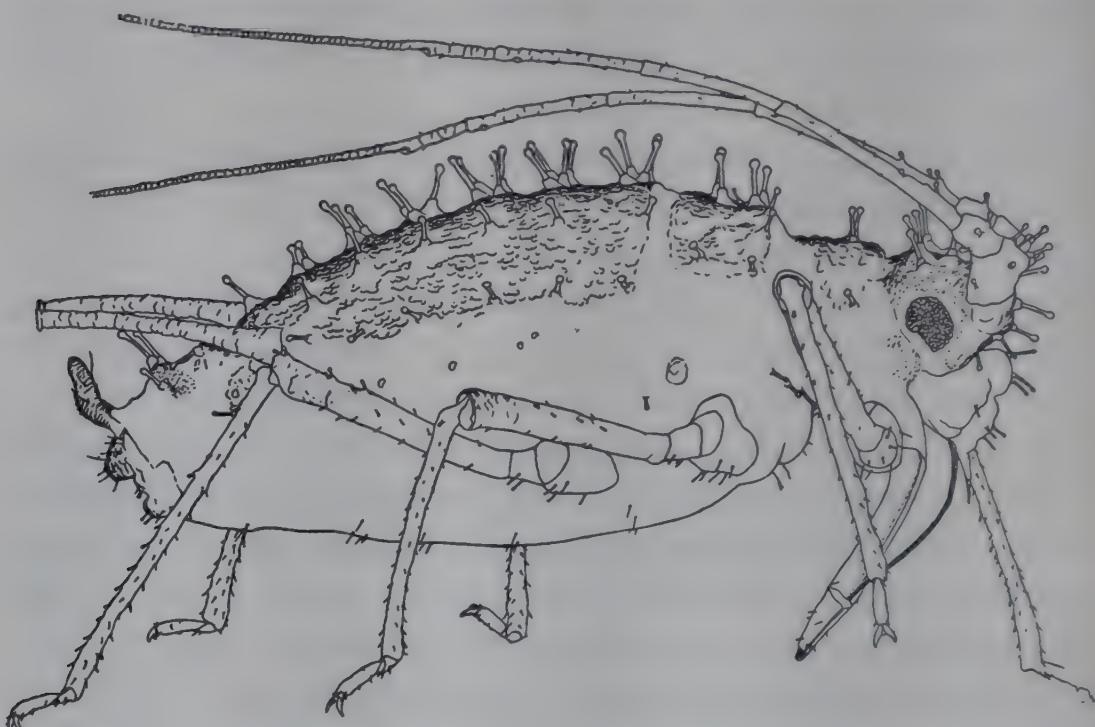
There is, open to the Research Stations and others, an alternative policy to that of eliminating virus, and that is the more positive one of studying not the virus but the plant. Some varieties are resistant. Why? Find the difference. Meanwhile, in practice, breed for that resistant quality if it is inherent in the genotype, which appears to be the case. The Russian pomologists are doing this, and they may be right after all. There ought to be ten times as much plant breeding going on in England as, in fact, there is. Not only for disease resistance, but for all good qualities. In France, during the past fifty years, at least 3,000 new varieties of grape-vines have been bred, and some of them have very remarkable qualities. In the same time several hundred strawberry varieties have been bred. Most of them have been failures, but many have been successful. Almost every year in Britain a considerable number of new roses are put into commerce. Why not fruit plants? Why not strawberries?

Meanwhile, what can the gardener do about virus in strawberries, apart from getting virus-free stocks to start with, or cultivating only virus-resistant varieties? He can rogue, of course, but there is nothing else, and if he *must* grow virus-susceptible kinds, he will simply have to replant every other year, or even regard his strawberries as annuals. A three-year routine is possible with even some virus-susceptible varieties, where rogueing is thorough and aphid control equally so. But the cost of that policy is probably greater than that of annual renewal.

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THE STRAWBERRY APHIS

Capitophorus fragariae Theo. is a rather large and very ugly beast, although not as large as our drawing of it! In colour it is yellow. I fancy that it rarely occurs in such numbers in strawberry beds as to do serious damage to the plants of its own



accord, but it is the vector of viruses. Its elimination from your beds is, therefore, some measure of virus-control.

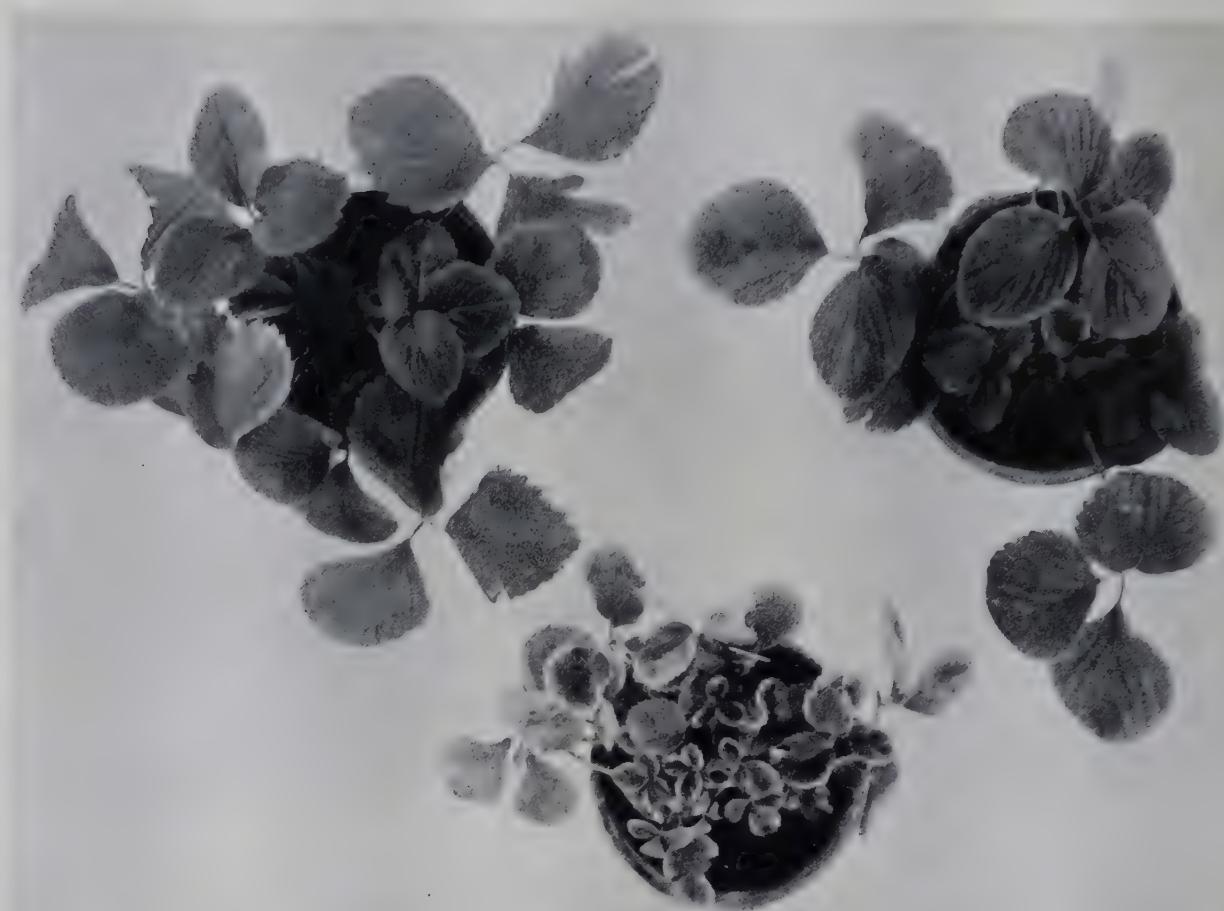
There are three spray controls of the aphis: the old one is nicotine, but as this substance is only effective if the weather is hot enough to volatilize it, and as the aphides lurk under the leaves, on the stalks, and in the crown of the plant, nicotine is not effective. The second control is one of the HEPT group, and these are more effective in that they are poisonous without volatilization, as liquids. However, contact with the aphis is necessary, and as it is well-nigh impossible to assure, this control is also very partial and unsatisfactory. Finally there are the organo-phosphorus systemic substances, such as parathion, which are unquestionably effective: they are absorbed by the plant, circulate in its sap, and thus poison any sap-sucking para-



Royal Sovereign showing Yellow Edge symptoms



Royal Sovereign showing Severe Crinkle symptoms



Top left: *Royal Sovereign* infected with virus 1 (symptoms not visible in photograph). Top right: with virus 2—slight chlorosis on young leaves.
Bottom: Virus 1 and 2 together—severe Yellow Edge



Aphides feeding on young strawberry leaf

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site, such as aphis. They are deadly poisons to human beings, animals and soil fauna, they persist for some time in the plant, and may render the fruit lethal, or at least very unwholesome. Their final and even secondary effects, if any, are unknown. They are still new, and it should be remembered that DDT was once said to be harmless to human beings, and has now turned out to be a cumulative poison which has already claimed its victims and has had to be banned in certain parts of the United States, at least in dairy-farm work. True, the nature of the organo-phosphorus poisons is very different. Many growers are using them. Personally, I would rather have aphis and virus disease, and grow plants which can put up a decent performance in soil which helps them, despite these afflictions.

Where spraying is resorted to, it must be frequent and thorough in the case of nicotine and HEPT. In the case of parathion or kindred products, the best plan is to have the work done by a thoroughly qualified plant pest control contractor, for the ordinary grower is not equipped with either the knowledge, or the gear, to make proper use of these deadly substances. Incidentally, they are extremely expensive . . . thank heaven!

EELWORMS

Several kinds of eelworm may establish themselves in strawberry plants, and will, of course, get into the runners and cadets, but not spread by way of the soil, apparently. Eelworm trouble is local and intensive, rather than common. Plants attacked by *Aphenleuchus fragariae* develop thickened stems, warping and thickening of the leaves, and bunching of the flower heads. This eelworm was diagnosed in some *Charles Simmen* plants in my garden, but subsequently the symptoms vanished and the plants grew normally. So perhaps there were no eelworm, or perhaps the plants learnt to put up with them. Another species, *Tylenchus devastatrix* apparently causes the plants to wilt and decay. There is no practicable control, and if the symptoms persist the plants should be burnt and new ones planted in their stead, elsewhere, just to be on the safe side.

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TARSONEMID MITE

Tarsonemus fragariae is a very small mite parasitic on strawberry plants and some alternative hosts. The mites feed on the heart of the plant, on the young and tender leaflets. In drought years attacks may be severe, but are less so in conditions of high humidity, so that watering is a control measure. Where the mites are present in force, the young leaves grow dry and brittle, their margins roll up, and there is distortion and crinkle so like the symptoms of virus disease that it is nearly indistinguishable until the mites are spotted and the cause of the trouble thus identified. From November until March, a population of adult female mites inhabit the crown of the plant. In March feeding and breeding begin, and population rises rapidly.

Only very partial control is obtained by 3 per cent lime-sulphur spray. The same is true in the case of an attack by another mite, Red Spider. However, sulphur in some form is noxious to the creatures, although it does not hurt their eggs. Probably control is obtainable with organo-phosphorus systemics.

Cadet plants, before planting, can be cleared of any suspicion of tarsonemid, aphis, eelworm and red spider, by plunging them for twenty minutes in water at a temperature of 110° F. In practice this method, though effective, has been given up because it is so difficult. Should the water fall below 108° F. the eggs of *T. fragariae* survive to hatch later; should the temperature surpass 114° F. the plants all die. To control the temperature of a considerable volume of water, within 5°, for twenty minutes, is difficult.

FUNGUS DISEASES

There are fungus diseases of the root, vegetation and fruit of the strawberry, all of which can be serious, but are, as a rule, not so bad as to reduce the crop by very much, with one exception. This is the root-rot called Red Core.

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ROOT ROTS

Several forms of root-rot due to fungus parasites may afflict strawberry plants, but as they are not controllable there is no point in describing all of them. Red Core, however, is common enough to need noticing.

First of all, there is a vast deal of difference in the resistance of varieties to this fungus: *Royal Sovereign* for example, is highly susceptible, while *Auchincruive Climax* is resistant. There do not appear to be any tables or guides published as to the resistance of all varieties, but nurserymen generally have an idea as to the probable behaviour of a variety in infested soil. The rot is due to a fungus called *Phytophthora fragariae*, and the name of the disease is due to the red core of the root which is a characteristic symptom. Dwarfing, failure to grow and finally the death of the afflicted plant may be symptoms. It is not practicable to control soil fungi, and moreover, once a bed of strawberries has developed this disease, the soil becomes useless for further strawberry planting. Tiny pieces of the root of the infected plants, left behind in the soil when the plants are dug up to be destroyed, husband the spores of the fungus until new plants, set in the soil, are available to them, whereupon they invade these also. In the case of any kind of root-rot attack it is best to destroy the bed and replant it elsewhere with clean stock.

OTHER FUNGI

Strawberry mildew seems to be a general name applied to several different fungus parasites: *Sphaerotheca humuli*, for example, which seems to start in the foliage, especially in the heart of the plant, attacks the fruit, often before it is ripe, but the attack is frequently masked because at the points invaded another fungus, *Botrytis cinerea*, takes over, causing the familiar mouldiness. The fruits affected first turn brown and rotten, subsequently become covered with a greyish powder, the distribu-

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tion of which causes the trouble to spread. The original mildew attack can be warded off by dusting the plants in April and May with finely powdered sulphur, which should be blown well into the centre of the plants. There is no control for botrytis, excepting that of limiting its sources of infection by the careful removal of all infected fruits at frequent intervals. Incidentally, a single fruit suffering from *B. cinerea*, placed inadvertently into a basket of fruit, will infect all those about it with surprising rapidity.

Stalks of strawberry leaves and flowers are sometimes attacked by a fungus called *Diplodina lycopersici*, which appears as a dark mark at the base of the older leaves and of the flower stalks. It can destroy the leaves and the flowers. There is no control other than burning the affected plants and making sure that no part of them falls to the soil. On the other hand, *D. lycopersici* seems not to attack the young leaves at the heart of the plant, so that growth continues. On the contrary, in the event of an attack by *Verticillium* wilt, both the old and young leaves are affected, a typical symptom being the change of the central leaflets from green to yellow and finally to brown. This fungus affects all parts of the plant, including the roots. There is no control, but *Verticillium* in strawberries is not common.

The leaves of strawberry plants are attacked by two fungi that cause reddish-brown patches which are easily taken for virus damage by the amateur, especially as considerable leaf distortion may occur as these patches fail to grow evenly with the rest of the leaf. *Mycosphaerella fragariae* causes small, purplish-red, rather regular patches with tiny white centres dotted with the minute black fruit-bodies of the fungus. *Diplocarpon earliana* causes redder, larger and less regular patches which spread like ink on blotting-paper until they join up and the leaf dies, or crumples itself up into an unsightly bundle. It is possible to check the development of these two fungi by administering a pre-blossom spray of 1 per cent Bordeaux mixture, but this is seldom done in England, for the fungi are rarely very troublesome, perhaps because the temperature of wet summers here is not high enough. In dry weather there is little to fear.

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The control of all fungus diseases is very largely in the grower's hands: if his plants are not overcrowded, are in a deep, well-drained soil very rich in humus, then the chances of any serious loss due to fungi are not great.

XII

EXPERIMENTING WITH STRAWBERRIES

It is too often taken for granted nowadays that creative horticulture is too difficult for the amateur, and that the creation of new varieties and strains must be left to the larger nurseries and to the scientific institutes. This is particularly the case with fruit, for new and admirable varieties of flowers are not uncommonly produced by amateurs. It is a great pity that so few English gardeners have the confidence to try creative work in fruit gardens, and there is no good reason for this want of confidence. It is true that excellent varieties have been produced by institutes and research stations, but do we know the name of the grower who first made Cox's Orange, d'Arcy Spice, White Calville apples? Or the Doyenne des Comices pear? Or the Old Greengage? Royal Sovereign was Laxton's work, but varieties as good had amateur patrons.

The amateur gardener who is reasonably handy could and should experiment with strawberry varieties, for strawberries are admirable subjects for such work.

SELECTION

Throughout the ages useful and beautiful plants have been improved by selection, the simplest method of creating new strains, and that to which we owe the first garden strawberries.

In the chapter on Propagation we have already glanced at the principles of improving strains by selection, but there we were concerned solely with the selection of the best young plants from

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the most vigorous parents. But selection can also be used to obtain strains with some particular attribute, flavour, perfume, colour, remontant habit, size and so forth.

Some attributes are obviously more difficult to select for than others: one may notice the outstanding flavour of a strawberry in a dish of strawberries, but one cannot identify the plant from which it came and that apparent special quality may not derive from the plant in any case. But there is nothing difficult or unusual in noticing, in a bed of strawberries, a single plant more fruitful, or with larger berries, or showing resistance to disease, or being earlier or later than all the other plants. The performance of this single plant may be, and probably is due to some fortuitous circumstance. That will not appear until later, and it is this doubt which adds an attractive element of gambling to the business of selecting for certain attributes.

Supposing that the gardener does notice a plant outstanding in some manner which is interesting and valuable. He will surround the plant with pots filled with compost and he will peg down its runner cadets into the pots. At the same time he should take, as 'controls', cadets from an average plant of the same plot, in a like manner.

Both lots of cadets are planted out in close enough proximity to be in identical conditions. In the following season the gardener watches them. Nine times out of ten the selected cadets show none of the attributes which attracted the gardener to their parent, but are identical with the control plants. This negative result is what the experimental gardener must learn to expect. The reason for it is simple: although the gardener had no means of knowing for sure, the outstanding qualities of the parent plant were due to external conditions and not to the plant itself. Maybe it had its roots in a particularly good soil; or it was sheltered, or favoured by sunshine, by reason of its position in the plantation. This being the case, why bother with selective propagation? Because, from time to time, the outstanding attributes revealed by a plant are innate, and not simply the product of favourable conditions. Most commonly, innate superiority in some or several attributes is due simply to the appearance, in an

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individual plant, of the best qualities of the clone : for, when we define the qualities of a clone or a variety we are actually defining an abstraction, in this case an average, or norm. For example if we say that in given conditions of weather and soil, plants of clone A, *Royal Sovereign* will begin to flower on April 30th, we do not mean that every plant will open its first flower on that day. Probably we mean that a noticeable majority of plants will open flowers on April 30th. Some will be earlier and others later. Of these the vast majority will be earlier or later because of some advantage or disadvantage in the very local environment. But one or two may be, as it were, 'naturally' earlier, and if they are picked out, and their own earliest cadets selected, and the same routine followed for several years, the result will ultimately be a clone of which the flowering date average is earlier than that of clone A.

A very much more interesting and very much rarer phenomenon is that whereby an individual plant actually changes its behaviour and begins to differ from its clone. It may happen that the outstanding quality noticed by the selective gardener is due to this cause, that is to a bud mutation or sport. Although certainly not very common, this phenomenon is very much more common than is generally supposed, but it often passes unnoticed because the variation from the clonal norm resulting from the mutation is either very slight, or it is of no interest to the gardener. Monsieur Louis Levadoux, the great French ampelographist, estimated that a worker who passes his entire lifetime in the care of a vineyard as large as one man can manage, will probably, in that time, see at least one valuable mutation. I daresay the same frequency may be true for other fruit plants. Thus the gardener practising selection has not a very large chance of selecting a really new variety, but it can happen, it has frequently happened, and will continue to happen. To-day, moreover, by the use of colchicine, it is possible to *provoke* mutations.

There appears to be some conflict between practical men, and science, in the matter of improvement by selection : there is no quarrel in the matter of bud sports. Both recognize that method

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of change. But the notion of the slow intensification of a quality in a plant variety, by selection generation after generation, where the propagation is vegetative, seems to fill the scientists with disgust and incredulity. It is not easy to account for such slow changes, but it is certain that they occur and can be made use of. In our own context, the most notable example is that of the American remontant, *Pan-American*. Possibly the protoplant was a mutant of *Bismarck*, but it seems clear that the flowering season of the new variety was made longer and longer, by selection.

HYBRIDIZATION

Cross-breeding for definite qualities is more efficient, far more difficult, calls for more time and patience than selection for new and improved qualities. It also calls for far more skill.

The would-be plant-breeder should begin by reading a simple book on genetics. It is true that genetics have contributed remarkably little to practical plant-breeding, and that all the best varieties of fruit plants have been bred by empirical methods and men who had never so much as heard of genetics. However, it is as well to understand the theory of what one is doing, if only to depart from it whenever it seems sensible to do so. Furthermore it is possible to master in theory the few rules which will be required in practice, and a knowledge of such phenomena as genetical sex-linkages will save the plant-breeder a good deal of trouble and time. If, for example, you know that a certain shape or tint of leaf is genetically associated with acidity in the fruit, you need not wait until a seedling bears fruit in order to reject it, if it has the shape or tint of leaf in question. In grape vines, the autumn coloration of the foliage is linked with fruit colour, so that the breeder can tell, in the first year of a seedling, whether it will bear black or white grapes.

There are other theoretical matters which can be useful. It seems, for example, that it is by no means indifferent whether you pollinate variety A with the pollen of B, or variety B with the pollen of A, to get an A x B seedling. For certain attributes

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are sex-linked. In human beings the sex of children is decided by the father, invariably: strange to think how, from the earliest times, men have blamed their wives for giving them only daughters! In plants there are similar rules, which must be discovered, so that the breeder knows which of his varieties to treat as pollen parents, and which as pistillate or female parents.

Now, as to practice, all we can give here are a very few rules.

1. The flower which is to receive pollen must be selected before the bud is open, but when it is about ready to open, and 'castrated'. For as most strawberry flowers are hermaphrodite self-fertilization will occur as soon as the pistils are receptive and the pollen ripe, unless it is prevented. The grower therefore removes the petals of the bud before it is open, with a pair of small tweezers, and taking great care. He then cuts off the stamens, leaving only the female organs. This mutilated flower is then enclosed in a small cellophane bag, to keep pollinating insects off it, and also wind-borne pollen grains.

2. Pollen must be collected only from fully open flowers of the pollinating or male variety, and on a day of warm sunshine when the pollen is likely to be ripe. The collecting can be done with a water-colour brush, which is rubbed against the pollen sacs on the end of the stamens. When the brush is yellow with pollen, then the cellophane protection of the female flower, provided it appears ready to receive pollen, in which case the female organ will be covered with a sticky exudation, is removed, and the pollinating brush gently rubbed on the pistil. Some pollen grains will adhere to it, and fertilization will take place. The cellophane cover must be replaced, of course. The whole operation must be done as quickly and deftly as possible, for not only is the uncovered female flower liable to be pollinated by wind-borne pollen, but even the brush may pick up some grains of alien pollen from some other strawberry variety, as it is carried from plant to plant.

3. As soon as the fruit has formed and ripened, and, by the way, the cellophane bag should be large enough to allow this to happen inside it, so as to protect this special fruit from birds and

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insects, take and germinate the seeds in the manner described in the chapter on Propagation.

The seedlings obtained from this first cross are denominated F.1 seedlings, F standing for *filia*, daughter, and 1 for *first*. For every one which may have the required, or other interesting attributes, there will be hundreds, and perhaps thousands which are worthless. All the seedlings must be grown on until they have borne fruit, and it is then possible to get rid of the bad ones, and select the interesting ones, if there should happen to be any.

The strawberry breeder has one very great advantage over the breeder of plants propagated from seed, like vegetables. His plants are propagated vegetatively, so that 'fixing' any good quality which he may chance to get in a seedling may be unnecessary. This fixing consists in inbreeding by 'selfing', that is by self-pollinating the new plant, and in growing an F.2 generation of seedlings in which the character required may have vanished completely, or may appear again, in which case it will be stable, although a third and fourth in-cross may be necessary to make perfectly sure of this stability.

STRAWBERRIES WITHOUT GARDENS

The town dweller without a garden may make a hobby of strawberries, for they can be grown in several odd ways. They can, for example, be grown in hydroponic tanks, but as this is a special subject of which I know nothing, I do not propose to discuss it: it is, in any case, not gardening, but an industrial *tour de force*.

There is a good deal to be said for growing strawberries in window-boxes, for they are beautiful plants, providing handsome foliage for nearly eight months of the year. The boxes should be provided with drainage by a deep layer of broken crocks at the bottom, with a few lumps of charcoal, and then filled with the compost described in an earlier chapter. If this be unobtainable, then a compost of fine loam, two parts, such as garden shops provide, and one part of granulated peat, would do if generously reinforced with blood and bone.

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The variety to be grown should be a remontant, of course, so that the window boxes would be full of white flowers and red fruit for several months of the year, not simply for three weeks. The variety should be runnerless, or nearly so, say *Charles Simmen*, or *Général de Gaulle*. Both the flowers and fruit of these varieties are very decorative: incidentally, I have never seen any reference to the beauty and fragrance of strawberry flowers: a small bunch of them makes a delicate bouquet and the scent is spicy, rather like nutmeg.

Alternatively to a remontant variety one might plant a runnerless Alpine, for example *Baron Solemacher*, the foliage being more beautiful than that of the remontants, and the fruit also, and more gracefully carried. If this variety is chosen, the seeds can be planted directly in the window-box, and the seedlings thinned out as they grow to fill other boxes.

For those who have a yard, a terrace, or an urban garden so small that there is no room for strawberry beds, then barrel cultivation will provide them with fruit. Any barrel from 14 to 48 gallons will do, but it should be remembered that once filled with soil it will be extremely heavy, and therefore it should be filled in place, and no attempt made to move it afterwards.

Before the barrel is filled, bore 2-inch holes at 12-inch intervals, or slightly more or less to get an even distribution around the barrel, in rings 12 inches, 21 inches and 30 inches from the bottom, and so on up to within 6 inches of the upper rim. Each hole is to take a plant, so that you will get the equivalent of a considerable strawberry bed in very little space. The bottom of the barrel is filled with drainage material, and then compost put in and pressed down very hard indeed until the first ring of holes is reached. Compression of the soil is essential, for otherwise it will sink afterwards and drag the plants with it. When the soil is level with the lower holes, then the roots of the strawberry plants are threaded through these from the outside, leaving the vegetation outside, and the roots spread on the soil. Filling of the barrel and compression of the soil then continues until the next ring of holes is reached, when the planting process is repeated. It is very important that the soil be well watered as you

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go, but not, of course, made sodden. As soon as all the rings of holes are planted and the barrel is full, plant a final three or four plants on the top.

Here, again, remontant varieties should be used, so as to get a really large crop, and runnerless varieties will give less trouble. By reason of the fact that some plants are exposed to all four cardinal points, the ripening of each flush of fruit will be well spaced. Finally, if the barrel is standing in a conservatory or greenhouse, a May crop will be obtained with early varieties, and, with remontants, an October crop.

* * * *

In the Frankfurt gallery there is a painting by a nameless fifteenth-century master, known as the 'Mary Garden'. It is crowded with plant symbolism. Strawberries have their place: they occur at the feet of Saint Michael, and they stand for the fruits of righteousness. An admirable symbolism.

Formerly, it was a case of,

*Wife, unto thy garden and set me a plot
With strawberry rootes of the best to be got;
Such, growing abroad, among thornes in the wood
Wel chosen and picked prove excellent good.*

Since then, twelve or fourteen generations of travellers, botanists and gardeners have turned those wild strawberries into such a fruit as Tusser and Parkinson, and that great strawberry man, 'Master Vincent Sion, who dwelt on the Banck side, near the old Paris garden stairs . . .' would scarcely have believed possible. Let us honour these ingenious and industrious artists by paying a proper respect to their works, and growing strawberries as well as they can be grown and eating them in the proper spirit, that of the aesthete who enjoys an experience in sensation made possible for him by nature and art in partnership.

APPENDIX

Fragaria Vesca, L.

Leaves ternate; lateral leaflets generally sessile. Scapes hairy with the hairs spreading. Pedicels with the hairs ascending or adpressed. Flowers perfect. Calyx spreading or reflexed after flowering. Fruit receptacle globular or ovoid-conical, broad at the base, bearing carpels throughout. Rootstock terminating in a barren tuft, sending out long, slender, reddish runners which take root at the nodes, where small leafy tufts are produced. Leaves radical, stalked.

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